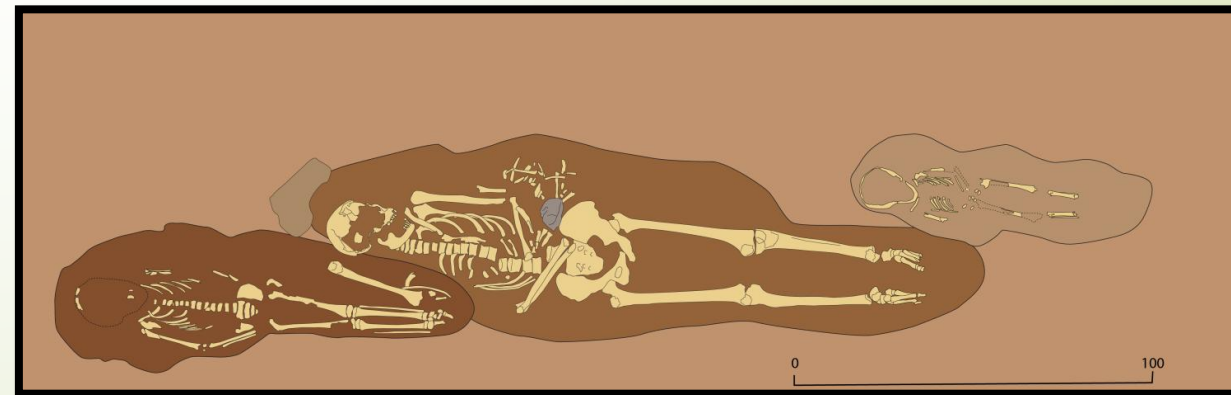
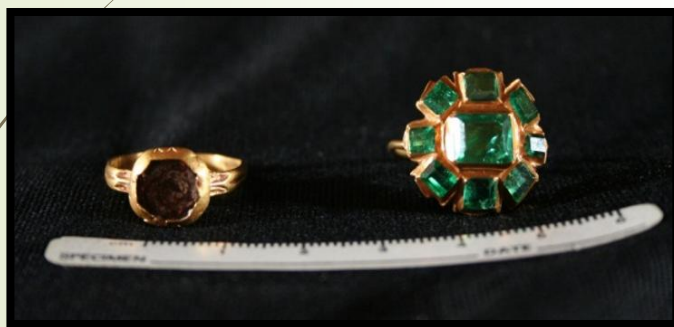


# *The Santa Cruz 35 Cemetery*

## **Data & Analyses: Results & Interpretations**



*Drs. Raymundo A.C.F Dijkhoff*



- **1. INTRODUCTION**
  - a. Data
  - b. Analyses
  - c. Results & interpretations
- **2. SUMMARY LECTURE 1 “CAMPAIGNS, EXCAVATIONS & IMPACT”**
  - a. Campaign 2001
  - b. Campaign 2012
  - c. Campaign 2016
  - d. Overview experiences & impacts
- **3. ARCHAEOLOGICAL, PRECONTACT & HISTORICAL CONTEXTS**
  - a. Archaeological context of research
  - b. Precontact & Historic contexts location of cemetery
- **4. COLONIZATION AND BURIAL TRADITIONS**
  - a. Modus operandi Spanish Conquest & colonization
  - b. Colonialism characteristics, main types & transformations
- **5. ARCHAEOLOGY OF CULTURE CONTACT: METHODS AND THEORY**
  - a. Regional diversity Early and Late Contact periods
  - b. Contact & Transculturation site concepts
  - c. Summary of methodologies (buried population in a colonial cemetery)
  - d. Isotopic analysis
- **6. FUNERARY ARCHAEOLOGY & OSTEOARCHAEOLOGY OF THE SANTA CRUZ 35 CEMETERY**
  - a. Three lines of investigations
  - b. Osteological analysis
  - c. Taphonomical analysis: burial/funerary practices
  - d. Isotopic analysis
- **7. FUTURE/NECESSARY RESEARCH AND ANALYSES**
  - a. Planned research archaeometric techniques
  - b. Nano sampling of grave goods
  - c. Typological, stylistic and petrographic analyses
  - d. Biomolecular analysis & other archaeometric analyses
  - e. Desired researches and under analysis
- 8. CONTENTS LAST LECTURE OF THE SANTA CRUZ 35 CEMETERY**
  - a. Confrontation of diverse worldviews
  - b. Late Medieval concepts of body and soul in the Old and New World
  - c. Late Medieval deathways in the Old and New World
  - d. Transformations in Deathways and Lifeways in Aruba and region
  - e. Concept Site of Conscience (heritage site)
  - f. Research questions and relevance





# 1. Introduction

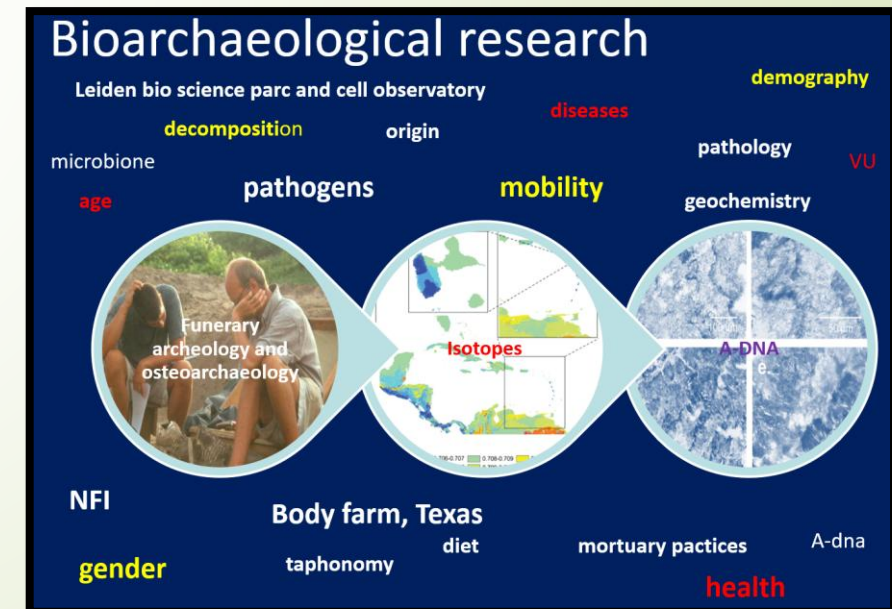
## ➤ a. Data



## ➤ b. Analyses



## ➤ c. Results & interpretations

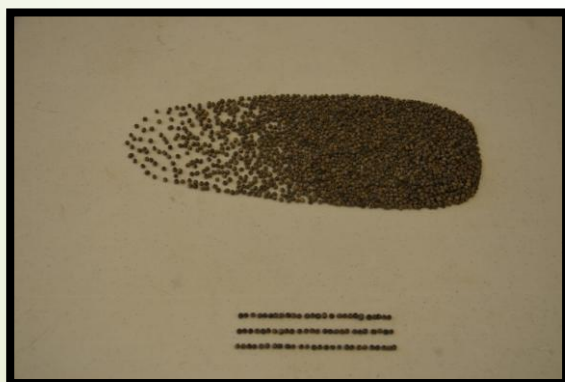




# 2. Summary Lecture 1 “Campaigns, Experiences & Impact”

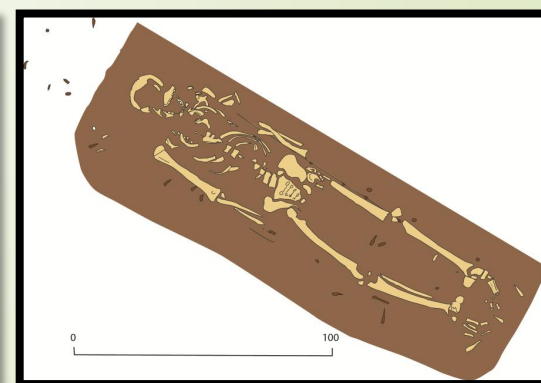
## ➤ a. Campaign 2001

- ❖ Rescue excavations (3x 3 days in the field)



## ➤ b. Campaign 2012

- ❖ Planned excavation (8 months in the field)





# 2. Summary Lecture 1 “Campaigns, Experiences & Impact”

## ➤ c. Campaign 2016

- ❖ Planned rescue excavation (5 days in the field)



### SKELET DI CACHO ENTRE 200 PA 400 AÑA BIEU: UN DESCUBRIMIENTO HISTORICO

October 28, 2016  
419



Un cacho dera cu diferente artefacto acerca ta marca como un descubrimiento historico, asina arkeologo Raymundo Dijkhoff ta declara.



### Preliminary Report on multiple isotope analysis of archaeological remains from Santa Cruz, Aruba

UNIVERSITEIT LEIDEN

March 1, 2016  
Jason E. Laffoon, PhD

## ➤ d. Overview experiences & impacts

- ❖ Treated burials, finds and dimensions excavations





# 3. Archaeological, Precontact & Historical Contexts

## ➤ a. Archaeological context of research

- ❖ **Historical Archaeology:** a sub-discipline of the archaeological family born in the 1930's and fully recognized as such in the United States in the late 1960s
- ❖ **Indigenous-colonial interaction** in Americas
  - “Contact archaeology”: impact of **European** influence on **Indigenous** cultures
- ❖ **Attention since Quincentenary** (Caribbean & Latin America)
- ❖ **North American experience** dominated investigations of “colonial entanglements”: set agenda for global investigations (theoretical/methodological)
- ❖ Despite attention **European trans-Atlantic expansion** (European-American encounter) and the long-lasting consequences of this interaction, **little attention** for:
  - The **islands offshore Venezuela**
  - Especially the **ABC islands of Aruba, Bonaire and Curaçao**
- ❖ **Archaeological research** of the Dutch Caribbean **after the advent** of the Spanish around 1500 CE **falters**
- ❖ **Historic research** only starts after the arrival of the **Dutch West India Company** in 1634 CE

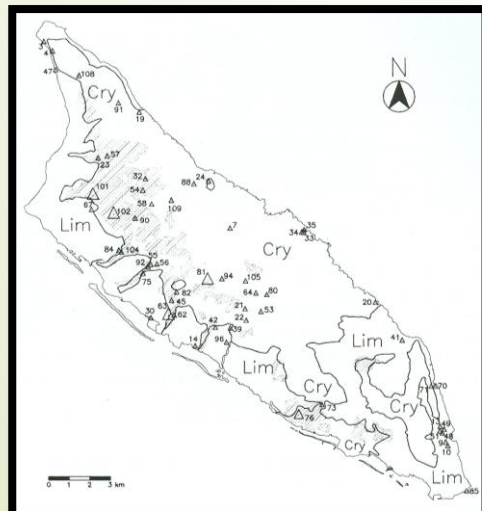
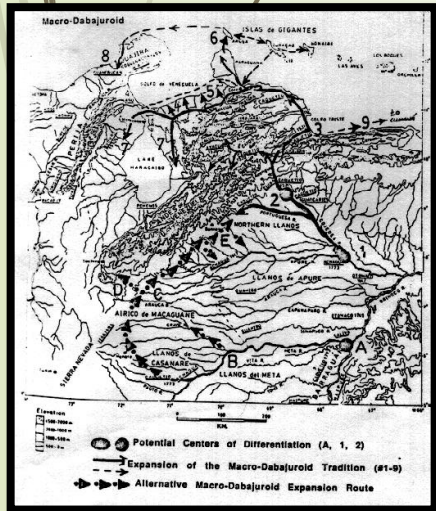




➤ **b. Precontact & Historic contexts location of cemetery**

❖ **Precontact Period:** habitation area of the largest **Ceramic Period (900/1000-1515 CE)** Dabajuran/Dabajuroid (**ethno-historic Caquetío**) site in Aruba

- Amazonid
- Agriculturists (mixed strategy)
- Riverine and maritime navigation
- Villages (5/6): sedentary
- Houses: round and oval
- Socio-politically part of Coastal Falcón Paramount Chiefdom
- Hierarchical system
- Caquetío language
- Complicated funerary practices





# 3. Archaeological, Precontact & Historical Contexts

- ❖ **Contact/Historic Period Santa Cruz**
  - Indigenous **capital** Aruba
  - **Santa Cruz area** known for its extensive **precolonial and colonial remains**
  - The extent of the colonial **Indigenous component** was **not well known** until recently!
- ❖ **Name Santa Cruz** symbolism Spanish Christianity: **association church and/or Holy Cross** (Conquest, colonization & missionization)
- ❖ **Treaty Cacique Manaure – Juan Martínez de Ampíes/Ampués** (26<sup>th</sup> July 1527 also **foundation of Coro**): **Indios de Real Corona**
  - a. **First [European] capital** of General Captaincy Venezuela
  - b. **First diocese American** continent [1531])
- ❖ Important **marriage**: **Cuabana Manaure** married **Juan Antonio Martínez de Ampíes/Ampués**)
- ❖ **Original cross Santa Cruz** (new one 1968):
  - Commandeursbaai meeting **Golmir – Simas** (Cacique Aruba)
  - **Exchange artefacts**, little knife & wooden **cross**
  - **Christianized** after 2 days
  - **Article** pastor Ludovicus Maria Johannes Jansen  
Combercion di nos indjannan na Catolicismo”  
(journal La Cruz, 15-1-1908)
- ❖ **Church Santa Maria constructed in 1852** (later became Maira Imaculata)
- ❖ **Distance Cemetery Santa Cruz 35 to Maria Imaculata Church (ex-Santa Maria): 200m**
- ❖ Santa Cruz **district's name**: officially in **1863** (parsonage pastor De Vries)





# 4. Colonization and Burial Traditions

## ➤ a. Modus operandi Spanish Conquest & Colonization

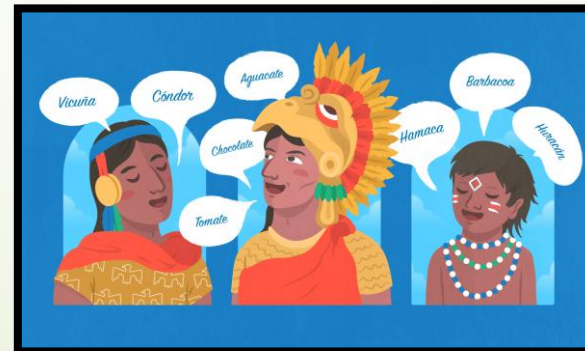
❖ Conquest with force: political center of society



❖ Religious indoctrination/imposing/convert to Christianity



❖ Imposition of language

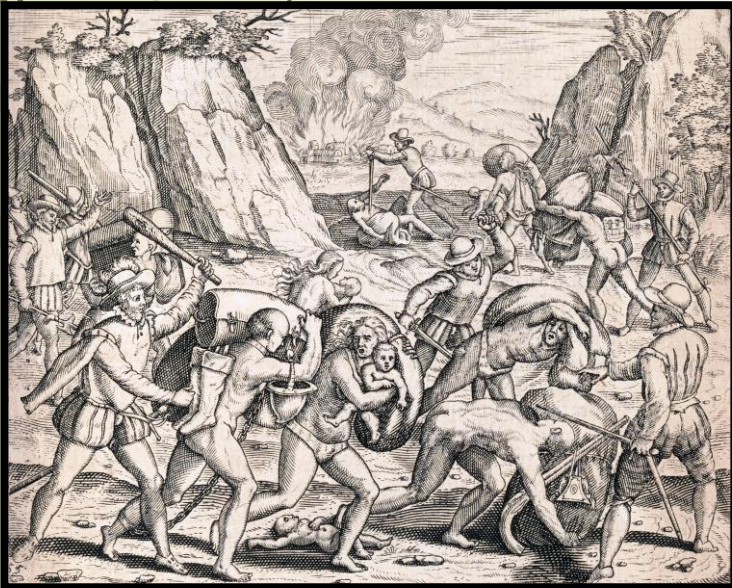




# 4. Colonization and Burial Traditions

## ➤ b. Colonialism characteristics, main types & transformations

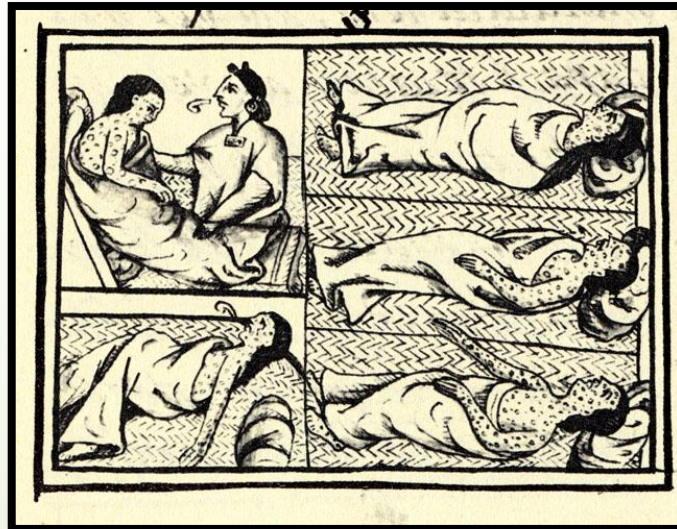
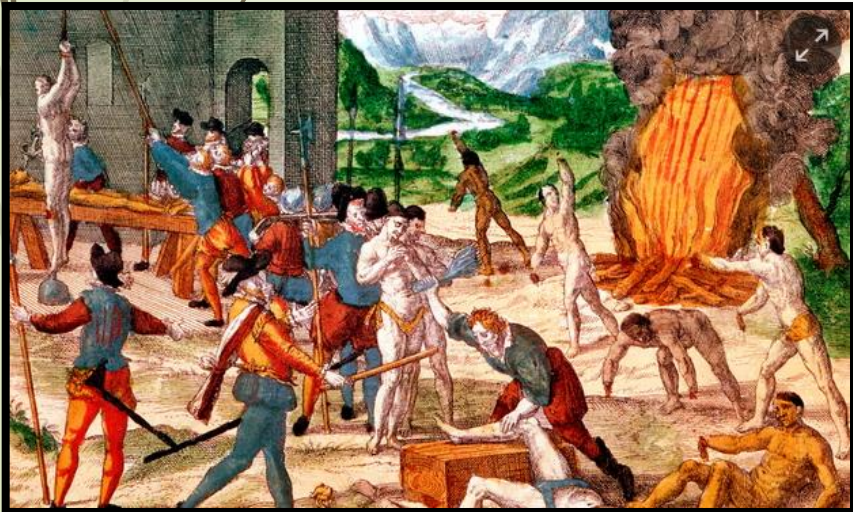
- ❖ **Characteristics:** a. Domination, b. Cultural imposition, c. Exploitation
- ❖ **Main types:** a. Exploitation-, b. Settler-, c. Surrogate-, d. Internal Colonialism
- ❖ **Colonization impacted Caribbean Indigenous lifeways and deathways:**
  - **transformations** in social and cultural traditions
- ❖ **Transformations:**
  - distinct variations in **time and space** related to Europeans different colonization practices
  - Indigenous varying strategies of **resistance & renegotiations**





# 4. Colonization and Burial Traditions

- ❖ **Changes** in Indigenous **burial traditions** show:
  - How the European **colonizers' influence and control** over the region as a whole **increased over time**
  - How the **manner and speed** of these **transformations** and **renegotiations** **varied locally**
  - That these people led physically **strenuous lives** (**biological markers** on the skeletons of Indigenous individuals from before and after the colonial encounters)
  - Changes in **Indigenous mortality** (increase in deaths after the arrival of the Europeans due to warfare, disease epidemics, and intensive labor exploitation) **impacted** the **composition** of the **population**
- ❖ **Responses** to **a. extensive upheaval** and **b. increasing influence and control** European colonizers affected:
  - Manner in which **death** and **dead** were **dealt** with
  - **Places** where the deceased were **buried**
  - **Indigenous ideas** of **physical** and **sociocultural realms** of the living and the dead





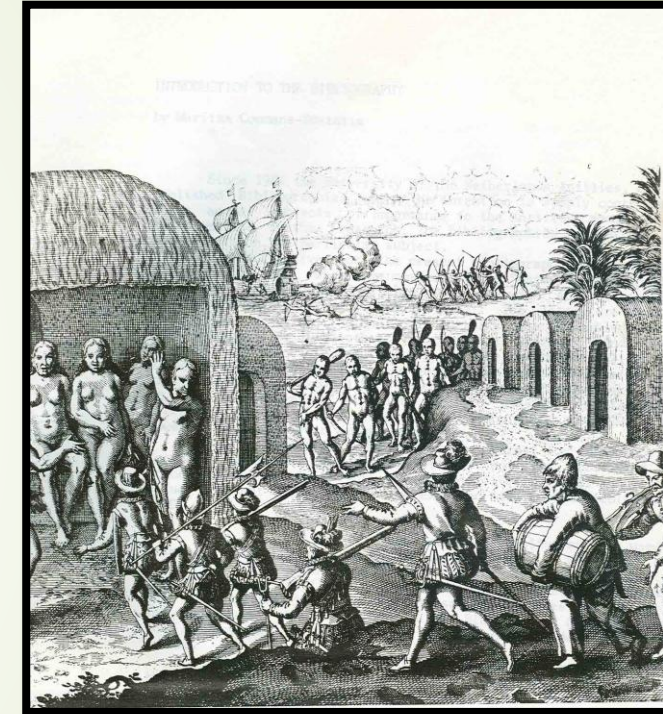
# 5. Archaeology of Culture Contact: Methods & Theory

## ➤ a. Regional diversity Early and Late contact periods

❖ Caribbean – insular and continental



❖ Aruba



❖ American/regional continent





# 5. Archaeology of Culture Contact: Methods & Theory

## ➤ b. Contact & Transculturation site concepts

### ❖ Archaeology of Culture contact and change (colonial dynamics, patterns, and connections):

- Investigates **contact sites** and **transculturation sites**

#### ➤ **Contact sites:**

European material is minimally present, principally on the surface and unmodified (**short or indirect interaction**)

#### ➤ **Transculturation sites:**

in addition to abundant European items European items with evidence of reuse or modification, Indigenous items imitating European characteristics are also present, both on the surface and in other levels  
(**longer relationship** and **intense cultural exchange**)

### ❖ Analysis of artefacts:

- Artefacts on the **surface** that **do not** represent **intrinsic variation** or **traces of use and reuse**
- Artefacts of defined **stratigraphic levels**, with **intrinsic changes** that have **evidence of use and reuse**
- A **new product**, i.e., the creation made by these groups through **cultural symbiosis**





# 5. Archaeology of Culture Contact: Methods & Theory

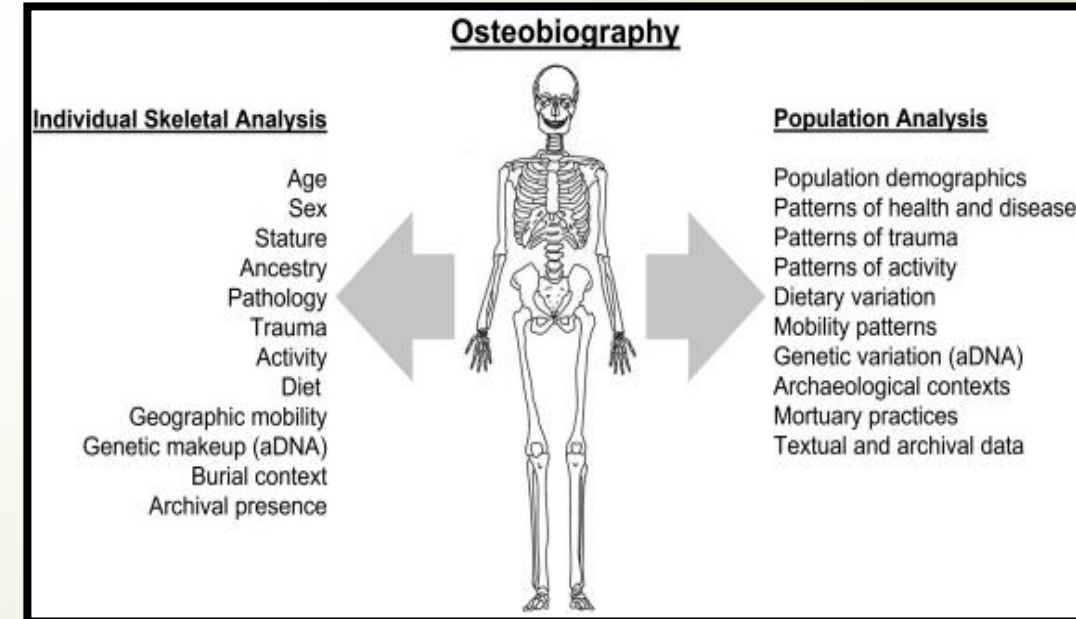
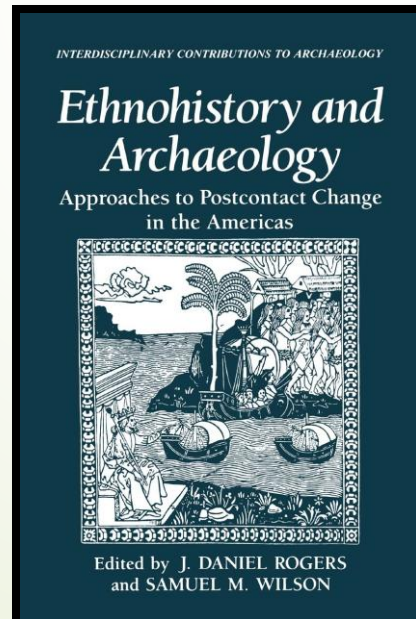
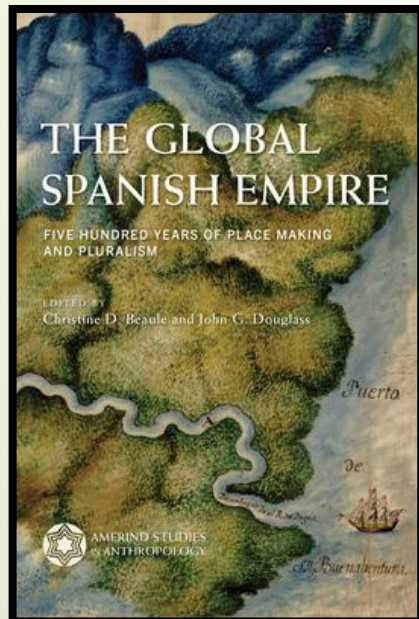
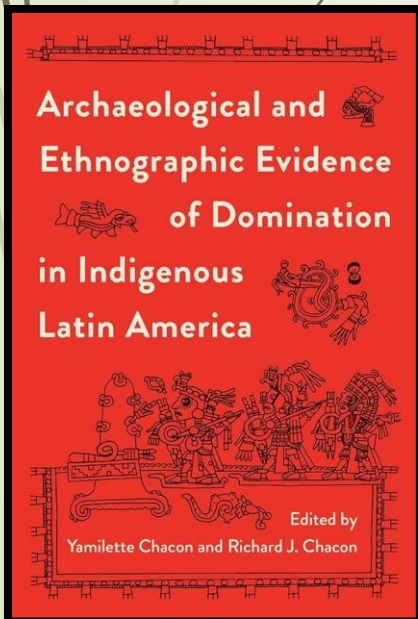
## ➤ c. Summary of Methodologies (buried population in a colonial cemetery)

### ❖ Historical archaeology

- Archaeology of **Pluralism**
- **pre-Columbian & Historic Archaeology** (resources and skills of both disciplines)
- The use of **ethnohistorical** and **ethnographic** sources (anthropology in historical archaeology)
- The study of **Culture Change in Pluralistic Contexts**
- **Pan-regional comparisons**

### ❖ Osteoarchaeology

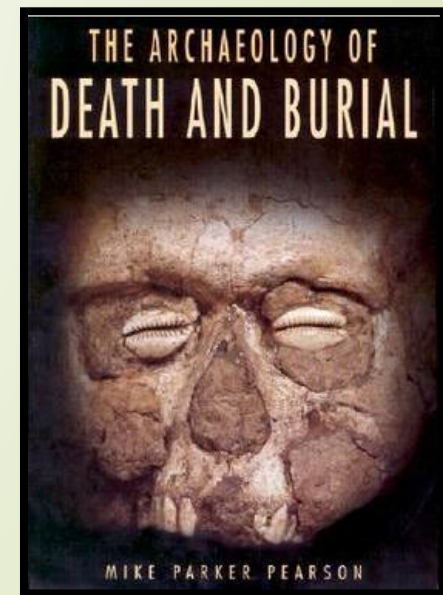
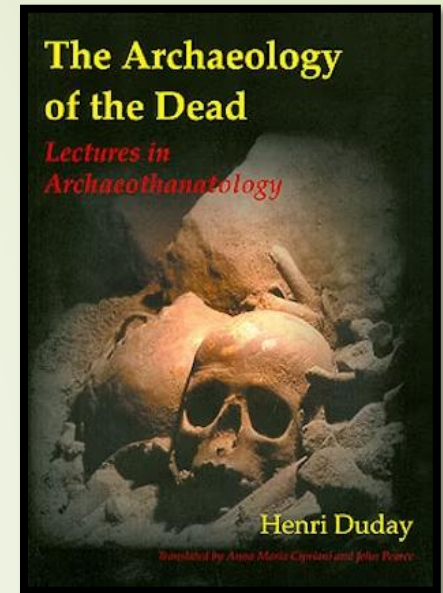
- The study of **archaeological human remains**
  - A dynamic, **interdisciplinary** field
  - A **variety of approaches**, ranging from **macroscopical examination** of the whole **skeleton** to the **microscopical** and **chemical analysis** of samples





# 5. Archaeology of Culture Contact: Methods & Theory

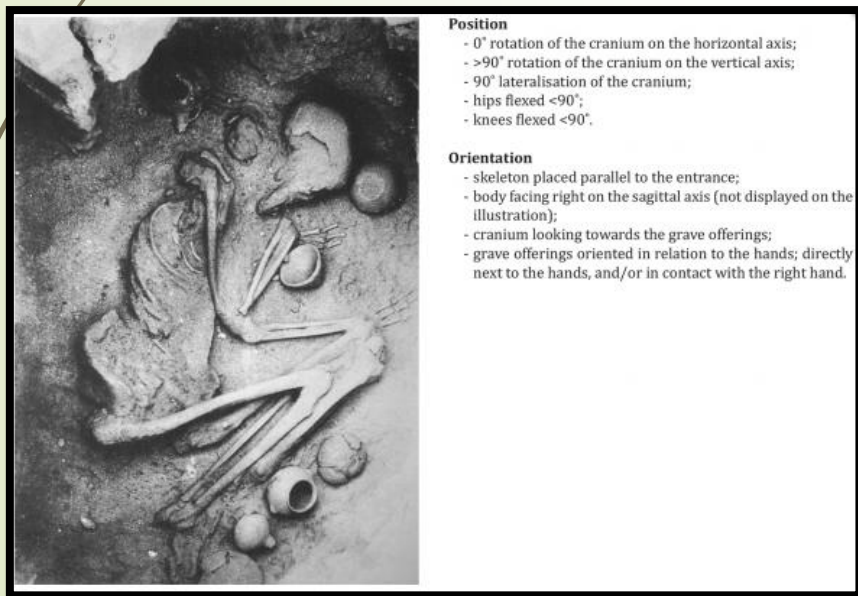
- ❖ **Mortuary or Funerary Archaeology** (sub-field of **bioarchaeology**: stems from **human osteology**)
  - The application of **archaeoethanatology** is the most **crucial tool** to reconstruct the funerary practices (analysis context of human burials)
  - “**The archaeology of the death in all its dimensions**”: is aimed to understand **how the dead body was treated**, and which **factors influenced the final condition** and **position** of skeletal remains
  - Emphasizes the study of **taphonomic changes/evidence** and detailed observations of bones and objects of material culture both **recorded in the field** and evidence observable in subsequent **laboratory analysis** for the reconstruction of mortuary treatment and context
  - Includes **excavation protocols** for the contextualized study of unearthed human remains in their depositional context
- **Methodological approach:** aimed at **reconstructing the natural and human factors** involved in the **formation of a burial feature (funerary behavior)**, including single burials, commingled multiple depositions, cannibalism, and the cultural reuse of human skeletal parts





# 5. Archaeology of Culture Contact: Methods & Theory

- ❖ **Position of the skeletal remains** in a grave does not always reflect the original body position, which is influenced by the mode of body treatment (e.g., wrapped, placed in a container, desiccated/mummified) before and during the burial
  - **How the body was treated** is a crucial part of meaningful and **ritualized funerary behaviour**, which is intimately associated with **concepts of death and decay, the afterlife, and agency of the deceased**
  - Understanding of **soft tissue decomposition**, the sequence of disarticulation of the joints (**necrodynamics**: movement out of anatomical relation), and how a **multitude of factors** and **taphonomic processes** contribute to **in situ displacement of the bones** observed in archaeological investigations, is the key to infer post-depositional movement of skeletal remains within a **burial feature**
  - **Experimental studies** (actualistic taphonomy)
  - **Chîne opératoire funéraire**: funerary taphonomic aspects (disarticulation, dispersal, accumulation, fossilization and alterations) of the treatment and deposition of the once fleshed body









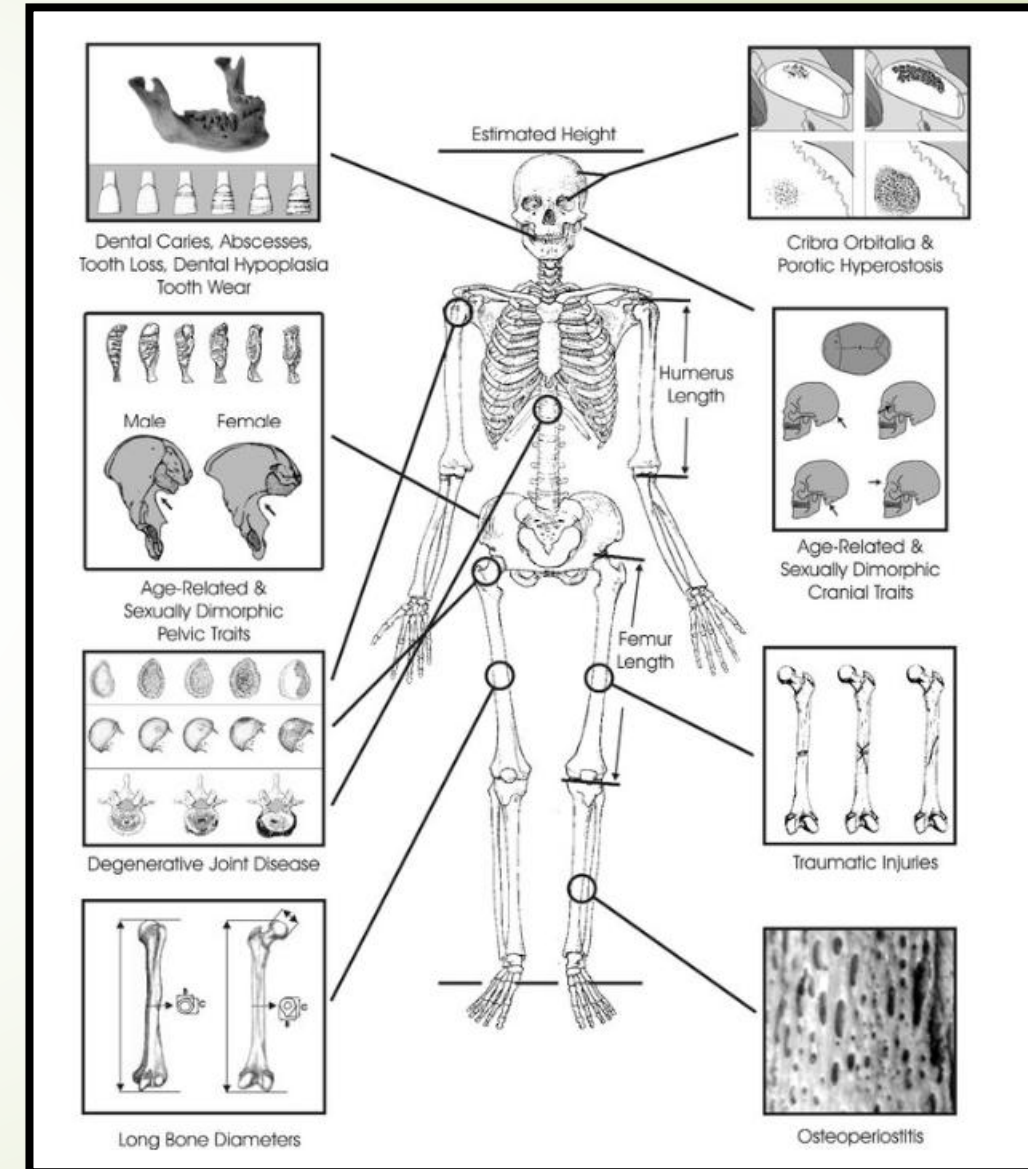
# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ➤ a. Three lines of investigations

- ❖ **Osteological** analysis
- ❖ **Taphonomical** analysis: burial practices
- ❖ **Isotopic** analysis (C&N; Sr isotopes; C14 dating)

## ➤ b. Osteological Analysis

- ❖ **Osteology**
  - Assesses a **biological profile** (e.g. sex, age, ancestry, and stature)
  - Evaluates **pathological conditions**, antemortem and perimortem trauma
  - Describes the overall **taphonomic modifications**
  - Can note **dental wear patterns**, **artificial cranial modifications** and **musculoskeletal stress markers**
- ❖ A total of ca. **50 burials** were encountered:
  - **22 burials** excavated (**28 individuals**)





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- ❖ The remains from **15 burial contexts** were examined
  - From these contexts, **26 individuals** were identified

## Composition of the burial assemblage

### 26 individuals identified:

16 juveniles (including 4 late adolescents)  
10 adults

### Sex ratio of the adults and adolescents:

12 females/possible females  
4 males/possible males

### Possible ancestry for 15 individuals:

8 European traits  
4 Amerindian traits  
3 mixed Amerindian-European traits

❑ Individuals of **all “age-at-death”** categories **present**

Age-at-death categories	Age-range in years
Non-adults	
Fetus	Less than 38 weeks in utero
Perinate	Birth – ~ 1 month post-natal
Infant	1 month post-natal – 2
Child	3 – 6
Juveniles	7 – 12
Adolescent	13 – 17
Adults	
Early young adult	18 – 25
Late young	26 – 35
Middle adult	36 – 49
Old adult	Older than 50



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

❖ Four burial contexts contained multiple individuals

❖ Preservation of the human remains

- Evenly distributed between **good (30.8%)**, **fair (30.8%)**, and **poor (30.8%)**

❖ Completeness of interred skeletons

- **Majority** of skeletons **not complete** (16 skeletons [61.5%] less than 25% of bones, and 21 [80.1%] having less than 50% of bones present)

Burial context	Primary interments	Secondary interment/Additional bones and teeth	Comments	MNI
1	J, 7-9	J, 1-2	Primary interment in extended supine position with arms on pelvis.	2
13	None	?M, 16-18, ?F, <18, F, adult, foetus	Individuals mixed together in one context.	4
15	F, 26-35, J 4-5	J, 1-2 Two additional adolescent/young adult humerus fragments.	Female primary interment in extended supine position with arms across abdomen. Juvenile 4-5 in extended supine position with arms by sides. Juvenile 1-2 is disarticulated.	2
37	M, 16-18, F, 46+	J, 3-5, ?F, 16-18, F, 36-45, F, 18-25 Two additional teeth, foetal rib.	Male primary interment is coffin burial, extended supine, with hands clasped at right shoulder in "sleeping position". Female primary interment is in extended supine position with hands crossed on pelvis. Other individuals mixed together.	6

☐ Burial contexts with **multiple individuals** present

Preservation	Excellent	Good	Fair	Poor	Very Poor	Total
Number of individuals	0	8	8	8	2	26
Percentage	0%	30.8%	30.8%	30.8%	7.6%	100%

☐ Preservation of the human remains

Completeness	0-25%	25-50%	50-75%	75-100%	Total
Number of individuals	16	5	2	3	26
Percentage	61.5%	19.2%	7.8%	11.52%	100%

☐ Completeness of interred skeletons



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ❖ Demography

### ➤ Age estimation (10 adults and 16 juveniles)

- a. **Majority** in category **1-4 years (30.76%)**
- b. **Adults:** mostly age group **36-45 years (40%)**
- c. **Juveniles** (bimodal distribution):  
**1-4 years (50%)** and **15-17 years (31.25%)**
- d. **Fetus** (1)
- e. No **infant** (< 1 year)

Age	Total	% of Total Population
<0 (foetus)	1	3.85
<1 yr	0	0.0
1-4 yrs	8	30.76
5-9 yrs	1	3.85
10-14 yrs	1	3.85
15-17 yrs	5	19.23
Juvenile < 18 yrs	0	0
18-25 yrs (Young Adult)	1	3.85
26-35 yrs (Young Middle Adult)	1	3.85
36-45 yrs (Old Middle Adult)	4	15.38
46+ yrs (Mature Adult)	3	11.53
Adult ≥ 18yrs	1	3.85
Age indeterminate	0	0.0
Total	26	100

☐ Age distribution of total skeletal population

Age	Total	% of Adult Population
18-25 years (Young Adult)	1	10.00
26-35 years (Young Middle Adult)	1	10.00
36-45 years (Old Middle Adult)	4	40.00
46+ years (Mature Adult)	3	30.00
Adult ≥ 18yrs	1	10.00
Total	10	100%

☐ Adult age distribution

Age	Total	% of Juvenile Population
<0 (foetus)	1	6.25
<1 yr	0	0.0
1-4 yrs	8	50.00
5-9 yrs	1	6.25
10-14 yrs	1	6.25
15-17 yrs	5	31.25
Juvenile <18 yrs	0	0
Total	16	100%

☐ Juvenile age distribution



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ➤ Sex estimation

- a. **Majority** of individuals were **female (56.25%)**
- b. With possible male/male and female/female **categories combined**; is **overwhelmingly female (75%)**
- c. **Females outnumber males by ratio 3-1**

Sex	Total	Percentage
Male	2	12.5
Male?	2	12.5
Female	9	56.25
Female?	3	18.75
Indeterminate	0	0
Total	16	100
Combined M+M?	4	25.0
Combined F+F?	12	75.0

☐ Sex distribution, including adolescents demonstrating anthroposcopic sex traits

Age	Male (M + M?)	%	Female (F + F?)	%	Indeterminate	%	Total	%
>0 (foetus)	0	0.0	0	0.0	1	3.85	1	3.85
juvenile <18 yrs	0	0.0	0	0.0	0	0.0	0	0.0
<1 yr	0	0.0	0	0.0	0	0.0	0	0.0
1-4 yrs	0	0.0	0	0.0	8	30.77	8	30.77
5-9 yrs	0	0.0	0	0.0	1	3.85	1	3.85
10-14 yrs	0	0.0	1	3.85	0	0.0	1	3.85
15-17 yrs	2	7.69	3	11.54	0	0.0	5	19.23
18-25 yrs	0	0.0	1	3.85	0	0.0	1	3.85
26-35 yrs	0	0.0	1	3.85	0	0.0	1	3.85
36-45 yrs	2	7.69	2	7.69	0	0.0	4	15.38
46+ yrs	0	0.0	3	11.54	0	0.0	3	11.54
adult ≥ 18yrs	0	0.0	1	3.85	0	0.0	1	3.85
indeterminate	0	0.0	0	0.0	0	0.0	0	0.0
Total	4	15.38	12	46.17	10	38.46	26	100

☐ Age and sex distribution

## ➤ Combined Age and sex data

- a. **Most common** is category **1-4 years (30.76%)**
- b. Secondly **Females 15-17 years & 46+ years** (both 11.54%)



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

❖ Ancestry estimation (15 individuals [58%]: 7 juveniles, 8 adults)

- a. **Eight European** ancestry
- b. **Four** potentially **Indigenous**
- c. **Three** both **European and Indigenous** traits

❖ Stature estimation

- a. Stature could **only** be estimated for **five individuals**
- b. It is **not possible** to draw any **general conclusions** regarding the height of the **population as a whole**

Sex	Male	Female	Female	Female	Female
Ancestry	European	Amerindian	European	European/ Amerindian	European
Stature estimation (in cm)	171.9	155.9	156.5	152.8	154.7

☐ Statures with corresponding sex and ancestry

Skeleton No.	Age	Sex	Ancestry	Trait(s)
6	2-3	-	European	incisors
7	46+	F	European	cranium, incisors
9	36-45	?M	European	cranium
13A	16-18	?M	European	craniometrics, femoral metrics
13C	18+	F	Amerindian	femoral metrics
15	26-35	F	European	incisors, femoral metrics
15B	4-5	-	Amerindian	incisors
20	46+	?F	Amerindian	femoral metrics
21	16-18	?F	European	incisors, femoral metrics (r)
			Amerindian	femoral metrics (l)
23	13-14	?F	European	cranium
25	36-45	M	Amerindian	femoral metrics
37A	16-18	M	European	incisors
			Amerindian	femoral metrics
37B-2	16-18	?F	European	femoral metrics
37C	46+	F	European	cranium, incisors, femoral metrics (r)
			Amerindian	femoral metrics (l)
40	36-45	F	European	incisors

☐ Estimated ancestry

# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ❖ Paleopathology

Skeletal pathology: **only two (7.69%)** showed signs of skeletal pathology

a. **Non-specific inflammation** (periosteal/endosteal new bone formation, osteitis, or osteomyelitis)

- **Male (16-18 years, Mestizo)**
- **Microporosity** and **erosion** affected only the **external cortical surface**
- The smooth nature of the erosion suggests that remodeling of the lesion had occurred – an indication that this lesion was **not acute**, and was more **likely chronic** in nature



- ❑ Superior view of body of S1 from 37C (F, 46+) showing osteophytosis and porosity



- ❑ (right) Inferior view of body of L5 from 37C showing osteophytosis and porosity



- ❑ Right and left parietal fragments of 37A (M, 16-18) with microporosity and erosion of the cortical surface

b. **Degenerative joint disease** (osteophytosis and porosity)

- **Female (46+ years, Mestizo)**, exhibited skeletal evidence for degenerative joint disease in the spine
- **Osteophytosis** occurring on its own is almost always an **age-related** phenomenon and **not necessarily pathological**
- She suffered from **intervertebral disc disease** in her lower back



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ➤ Dental pathology

- a. Relatively few teeth and jaws present (47% adult teeth lost/destroyed)
- b. 58% of juvenile deciduous teeth lost/destroyed
- c. 70% of juvenile permanent teeth lost/destroyed
- d. only seven demonstrated dental pathology

### ❑ Dental pathology recorded included:

1. **caries (13.09%)** – no discernable pattern
2. **calculus (only 11.4%: 3 adults)** – caused by mineralized plaque & general sign of poor dental hygiene
3. **antemortem tooth loss (3 adults)** – variations in dietary consistency (causes increased dental attrition/caries/calculus: may precipitate antemortem tooth loss), nutritional deficiency diseases, ablation (cultural purposes) and dental trauma
4. **hypercementosis (1 individual)** – accumulation of excessive cementum on lower half and apex tooth roots; due to periapical inflammation, excessive or insufficient mechanical stimulation of the tooth, Paget's disease or tooth repair (present in older adults or hunter/gatherers: heavy dental wear)
5. **supernumerary teeth (1 individual)** – origins not well understood (heredity? Result due to splitting tooth bud during dental development? Consequence of hyperactivity of dental lamina – band of tissue in a developing tooth)



❑ Supernumerary tooth present in nostril **F7 (F, 46+, European)**



❑ Left maxillary 3rd molar (left) and 1st premolar (right) of **F25 (M, 36-45, Indigenous)** with hypercementosis

# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

	Maxillae															
	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
teeth recorded	3	6	4	2	3	5	2	5	4	1	6	5	3	5	5	5
roots only recorded	0	0	0	1	0	1	1	1	2	4	0	0	0	0	0	0
total teeth + roots recorded	3	6	4	3	3	6	3	6	6	5	6	5	3	5	5	5
teeth lost antemortem	0	1	2	2	2	0	0	0	0	0	0	1	2	1	0	0
teeth lost postmortem	1	0	0	0	1	1	4	1	0	0	0	0	0	0	0	0
teeth destroyed (taphonomy)	6	3	4	5	4	3	3	3	4	5	4	4	5	4	5	5
not formed (agenesis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unerupted teeth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
possible number of total teeth	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
teeth with caries	1	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0
teeth with calculus	0	1	0	0	1	0	0	0	0	1	1	0	0	0	1	0
teeth with hypercementosis	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
supernumerary teeth	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

☐ Frequency of pathologies in adult maxillary dentition

	Deciduous Maxillae									
	5e	5d	5c	5b	5a	6a	6b	6c	6d	6e
teeth recorded	1	1	2	1	1	2	2	2	2	3
roots only recorded	0	0	0	1	1	0	0	0	0	0
total teeth + roots recorded	1	1	2	2	2	2	2	2	2	3
teeth lost antemortem	0	0	0	0	0	0	0	0	0	0
teeth lost postmortem	0	0	0	0	0	1	0	0	0	0
teeth destroyed (taphonomy)	5	6	4	5	5	4	4	4	4	3
teeth not formed (agenesis)	0	0	0	0	0	0	0	0	0	0
unerupted teeth	1	0	1	0	0	0	1	1	1	1
possible number of total teeth	7	7	7	7	7	7	7	7	7	7
teeth with caries	0	0	0	0	0	0	0	0	0	0
teeth with calculus	0	0	0	0	0	0	0	0	0	0

☐ Frequency of pathologies in juvenile deciduous maxillary dentition

	Mandibles															
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
teeth recorded	3	2	4	5	6	5	4	3	2	4	7	5	3	4	2	2
roots only recorded	0	1	0	1	2	2	2	2	0	2	0	1	1	0	0	0
total teeth + roots recorded	3	3	4	6	8	7	6	5	2	6	7	6	4	4	2	2
teeth lost antemortem	1	1	2	1	0	0	0	0	0	0	0	0	0	2	1	1
teeth lost postmortem	1	0	0	0	0	0	0	1	5	2	1	1	2	1	2	2
teeth destroyed (taphonomy)	5	6	4	3	2	3	4	4	3	2	2	3	4	3	5	5
not formed (agenesis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unerupted teeth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
possible number of total teeth	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
teeth with caries	0	0	0	1	2	0	0	0	0	0	0	1	1	1	1	0
teeth with calculus	0	0	0	0	0	1	1	1	2	2	1	1	1	0	1	1
teeth with hypercementosis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
supernumerary teeth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

☐ Frequency of pathologies in adult mandibular dentition

	Deciduous Mandibles									
	7e	7d	7c	7b	7a	8a	8b	8c	8d	8e
teeth recorded	0	0	1	1	2	2	1	2	1	2
roots only recorded	0	1	0	0	0	1	0	0	0	0
total teeth + roots recorded	0	1	1	1	2	3	1	2	1	2
teeth lost antemortem	0	0	0	0	0	0	0	0	0	0
teeth lost postmortem	0	0	0	0	0	0	1	0	1	0
teeth destroyed (taphonomy)	6	5	6	6	5	4	5	5	4	4
teeth not formed (agenesis)	0	0	0	0	0	0	0	0	0	0
unerupted teeth	1	1	0	0	0	0	0	0	1	1
possible number of total teeth	7	7	7	7	7	7	7	7	7	7
teeth with caries	0	0	0	0	0	0	0	0	0	0
teeth with calculus	0	0	0	0	0	0	0	0	0	0

☐ Frequency of pathologies in juvenile deciduous mandibular dentition



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

<1	1								
1-4	6		1						
5-9	3			1					
10-14									
15-17									
16-18	2	M	1		1		1		
16-18	4	F	2		1				
≥18	1	F		1					
18-25		M							
18-25	1	F							
26-35		M							
26-35	2	F	2					1	
36-45	2	M	1	1					
36-45	2	F	1					1	
46+		M							
46+	2	F		1	1	1		1	
Age	no. of individuals	sex	European traits	Amerindian traits	Eur/Amerind. traits	degenerative joint disease	inflammatory/infectious	caries	Abscesses

☐ All individuals related to age, sex, ancestry and diseases

	Maxillae															
	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
teeth recorded	0	4	4	5	3	5	2	2	3	2	2	4	3	4	5	0
roots only recorded	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
total teeth + roots recorded	0	4	4	5	3	6	0	2	3	3	2	4	3	4	5	0
teeth lost antemortem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
teeth lost postmortem	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
teeth destroyed (taphonomy)	2	4	5	6	7	5	8	8	7	6	8	6	8	5	2	2
not formed (agenesis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
unerupted teeth	4	1	3	1	2	1	1	1	1	3	2	2	1	3	0	4
possible number of total teeth	6	9	12	12	12	12	12	12	12	12	12	12	12	12	9	6
teeth with caries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
teeth with calculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
teeth with hypoplasia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

☐ Frequency of pathologies in juvenile permanent maxillary dentition

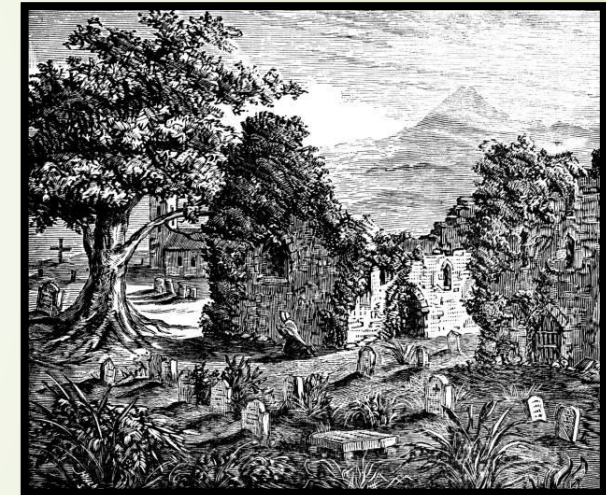
	Mandibles															
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
teeth recorded	0	3	3	2	2	2	1	0	1	2	4	5	4	5	3	0
roots only recorded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total teeth + roots recorded	0	3	3	2	2	2	1	0	1	2	4	5	4	5	3	0
teeth lost antemortem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
teeth lost postmortem	0	0	0	1	0	0	1	2	1	0	0	0	1	0	0	1
teeth destroyed (taphonomy)	3	6	7	8	8	8	8	8	9	10	7	5	5	3	5	3
not formed (agenesis)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
unerupted teeth	3	0	2	1	2	2	2	2	1	0	1	2	2	4	1	2
possible number of total teeth	6	9	12	12	12	12	12	12	12	12	12	12	12	12	9	6
teeth with caries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
teeth with calculus	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0
teeth with hypoplasia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

☐ Frequency of pathologies in juvenile permanent mandibular dentition

# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ❖ Conclusions demography, health and diet

- **Relatively poor preservation** (had an effect on the ability to reconstruct ancestry, stature, and population health)
- **Preservation and completeness** had **relatively little effect** on the ability to **age and sex** the Santa Cruz population
- **Fragmentary nature** and **small sample size** of the population **precludes detailed interpretation**
- The **demography** of the Santa Cruz burial population was **unusual**
- **Unusual lack of older adults (46+)** in the burial assemblage
- A definite bias in the **sex ratio**:
  - **females outnumber males (2:1)**
- Very **uneven distribution** of individuals across the **age categories**:
  - **most** of the population were **juveniles (57.69%)**
  - children aged **1-4 predominate (30.76%)**, followed by older adolescents **15-17 years (19.23%)**
  - There were **no infants (< 1 year)**: suggests **differential burial practices** for **infants?!?**
- It is a fixture of pre-Reformation European Catholic cemeteries:
  - ✓ **Unbaptized infants** were **denied burial** in **consecrated ground** (e.g. **church cemeteries**)
  - ✓ The Santa Cruz remains were interred with a **mixture of Indigenous and European Christian burial practices**, possibly in a **cemetery associated with a church**, is **not surprising** that **infant remains are missing** from the burial assemblage





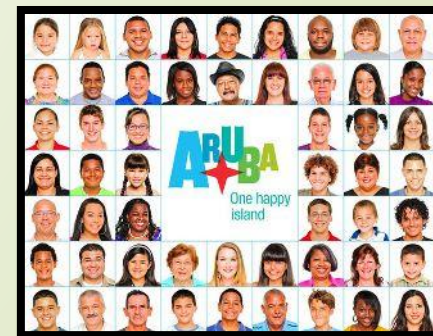
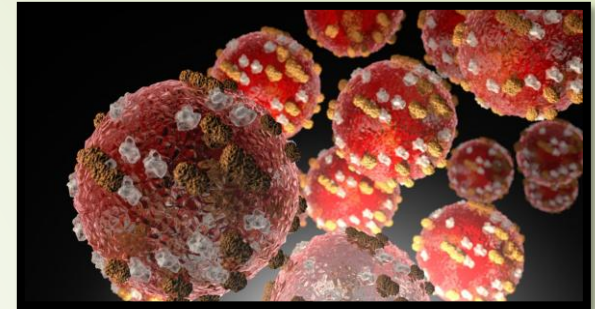
# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- **Ancestry determination** is a controversial practice within the field of biological anthropology
  - It would be beneficial to **supplement the interpretations** derived from the **morphological characteristics** of the **bones and teeth** with **ancient DNA and strontium isotope data** (creating multiple lines of evidence that would strengthen or refute the ancestry estimations)
- The **evidence** derived from an examination of the **burial practices** supports an interpretation of the **presence of both Indigenous and European individuals** at the site, as does the historical record
  - It is unfortunate that to date there are **no reference data from documented populations of mixed ancestral heritage**, so until then the identification of these individuals in the archaeological record will continue to be problematic
- **Extensive dental attrition absent**; little to moderate (lack of significant) wear:
  - population was **not engaged in extensive non-alimentary tooth use**
  - overall **diet was not particularly coarse**
  - A stark **contrast to most Pre-Columbian Caribbean skeletal populations**, where **dental attrition is high** due to **non-alimentary tooth use** and a **highly abrasive diet**: these individuals were consuming a softer diet and rarely used their teeth as tools
- The **low amount of caries** could be attributed to a **low consumption of carbohydrate sources**, namely **either starches or sugar**, instead leaning on a **more protein-oriented diet**
  - ✓ **Marine resources** contain **phosphate** and **calcium** that help prevent caries
  - ✓ **High consumption of marine resources** could have played a role in the **low prevalence of carious lesions** present among the Santa Cruz 35 individuals



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- **Stature estimates** for only **five Santa Cruz individuals**
  - **One male and four females**
  - The male (European) was 171.9 cm tall, considerably taller than the four females, estimated to be of Indigenous (1), European (2), and European/Indigenous ancestry (1): heights averaged 155 cm
- There was virtually no **pathology** present
  - Only **two individuals (7.7%)** demonstrating skeletal lesions
  - This **contrasts sharply** with **pathology prevalence rates** seen **other Caribbean archaeological sites**
  - **One individual** demonstrated an **inflammatory/infectious lesion in the skull** and **one individual** had **degenerative disc disease in her lower back**
  - Due to the relatively **chronic nature of these lesions**, it is **unlikely** that they contributed directly to the **deaths of these individuals**
- What may be at play in the Santa Cruz population is a **phenomenon** known as the “**osteological paradox**” (individuals without bony lesions are considered to be unhealthy, as their immune systems were unable to sustained bony response to the diseases that likely resulted in their deaths)
  - This would be denominated/called a “**catastrophic cemetery**” if an **infectious disease (bacterium, virus, or other microorganism)** was the **primary cause of death** of this population of mixed ancestry
  - **Children and adolescents do not typically dominate mortuary profiles**, as once children survive past the age of five, the risk of dying between then and adulthood is relatively low
- The **demography** of the Santa Cruz skeletal population (high proportion of children and adolescents) is **unusual**
- Coupled with a **lack of skeletal pathology** suggests that **acute infectious disease**, which does not leave a trace on the skeleton as the body has no time to mount a bony response before death occurs, **may have been the cause of death** for **many** in this skeletal population
- Based on the human osteological data presented here, it is possible that Santa Cruz 35 may be **the burial site of the small European and Indigenous population that predated Aruba’s European resettlement**
- The **Santa Cruz 35 “Criollo-Indigenous” community** is the **ancestral base & origin** of Aruba’s current globalized society (ca. 110 nations)

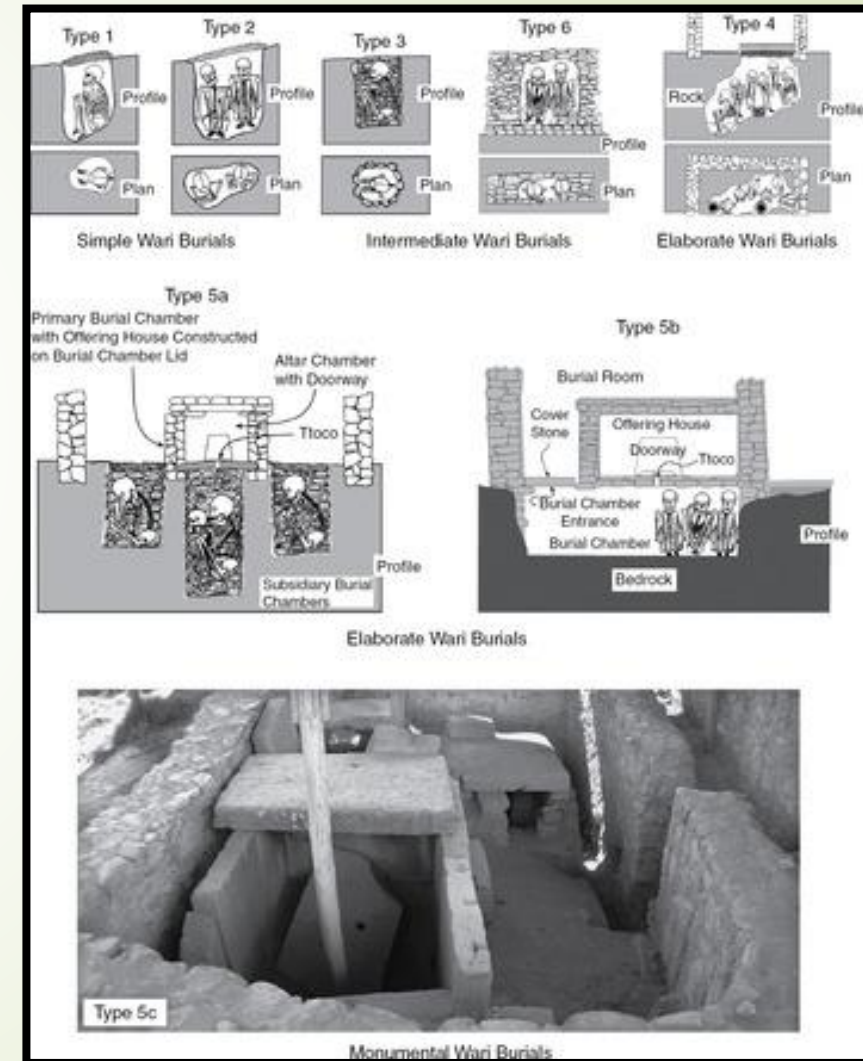




# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ➤ c. Taphonomical analysis: burial/funerary practices

- ❖ Using all the archaeological data (e.g., excavation and survey documentation, radio-carbon dates, archaeological data and studies of regional pre-Columbian and colonial cemeteries) the aim is to give:
  - An in-depth **description** of the Santa Cruz 35 cemetery dimensions
  - **Spatial organization**
  - **Site classification**
  - **Site chronology** in a **national** and **regional** context
- ❖ **Earlier research** on effects of **colonization process** on **Indigenous mortuary customs** focused on:
  - **Identifying changes** in **body position** in the grave
  - The **presence of European materials** with the skeleton (indicators of European influence)
- ❖ A **typology of funerary treatments** identifies and defines archaeological cultures through the:
  - **Reconstruction** of the **funerary space** (the **original space** occupied by the corpse)
  - **Ephemeral elements** that did **not** preserve
- ❖ The **synthesis** of these **treatments** + **biological data** of the **skeletal remains** permits **insights** into the **structuring of principles** of past societies:
  - The **spatial relationships** between the different constituents of the **grave**, the **cadaver**, the **structure of the grave**
  - The **grave inclusions** and **limits** of the **grave** with respect to the **rest of the site**



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ❖ Funerary practices at Santa Cruz 35

- The **position** of the deceased followed **strict rules**
  - **Supine** (extended) **position**
  - Strict **West-East direction** (Head-Legs)
- **Cristian position of hands** with **variations** in the **arm and hand positions**:
  - a. **arms folded across abdomen**
  - b. **arms at sides**
  - c. **hands on pelvis**
  - d. the hands **crossed over the pelvis**, and one **arm wrapped around the stomach** with the other **on the pelvis**
  - e. **four individuals** were **clasping their hands in prayer** at the upper thorax
  - f. **three individuals** were buried in variations of a “**sleeping posture**”, with the hands clasped at one of the shoulders, under the head
  - g. **one individual** in a “**sleeping posture**” also had a stone pillow
  - h. Different **positions/orientation faces**





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- Type A1. **Primary single burials** (majority of internments)
  - Both **adults & children**
  - **Coffin burials** (both **adults and children**)
- Type A2. **Primary burial** context with **multiple individuals**
- Type B1. **Secondary burial** context with one individual
- Type B2. **Secondary burial** context with multiple individuals (incl. ossuary)



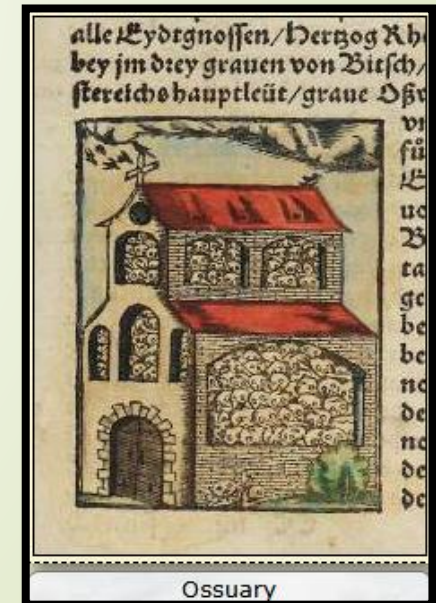
Burial. The corpse is inhumed in a shroud.



Burial

- ✓ Empty space present in burial chamber ("**primary open space**") and empty space created because of decomposition of soft tissues and structural elements such as wrappings ("**secondary open space**") allows
  - a. **rotation and movement of bones** can occur due to normal decomposition processes
  - b. **bone movement in coffins** can be affected by the collection of **decomposition by-products**, including both **movement of limbs** during **decomposition** and **stabilization of bones** when the **decomposition by-products** solidified
- ✓ Important to deduce what **kind of void** the deceased was **originally placed in prior to interpretations of causative taphonomic agents** is very important, because **different voids** allow for a **variability of potential taphonomic postmortem processes**, emphasizing the importance of considering **human taphonomy in situ** for **interpretations** of mortuary treatment related to deposition

- ❑ A number of the graves were **overlapping**
- ❑ **No grave markers** were present
- ❑ **Care taken to rebury** disturbed skeletal elements
- ❑ Buried in **shrouds** (**Christian** tradition)
- ❑ A number of burials contained **funerary gifts/artefacts/goods**

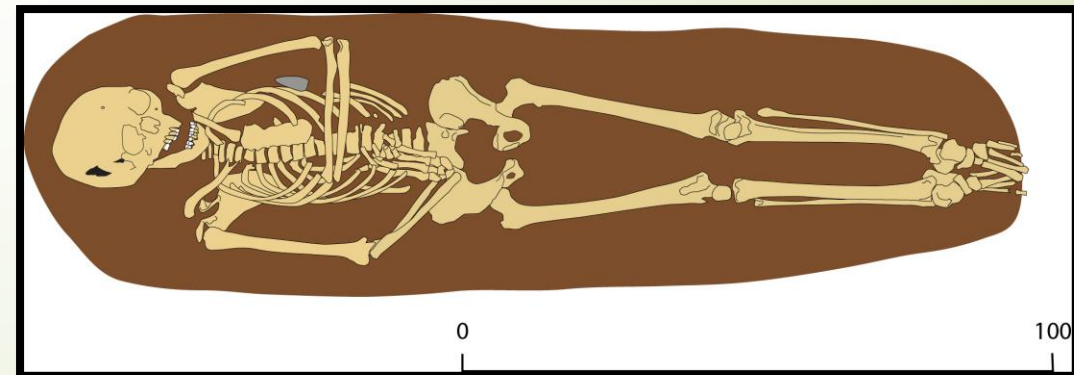
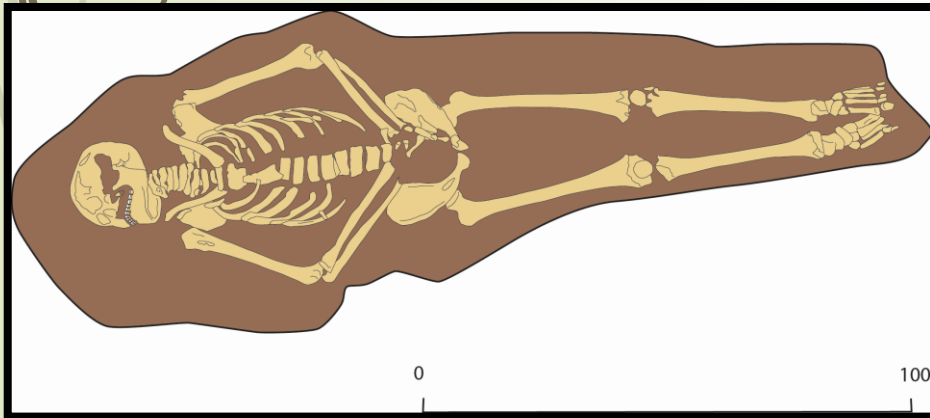


Ossuary



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- ❑ A1. Primary single burial
- ❑ Shroud
  - Christian burial tradition
  - Hands on pelvis and abdomen
  - Shell tool (Aliger gigas)

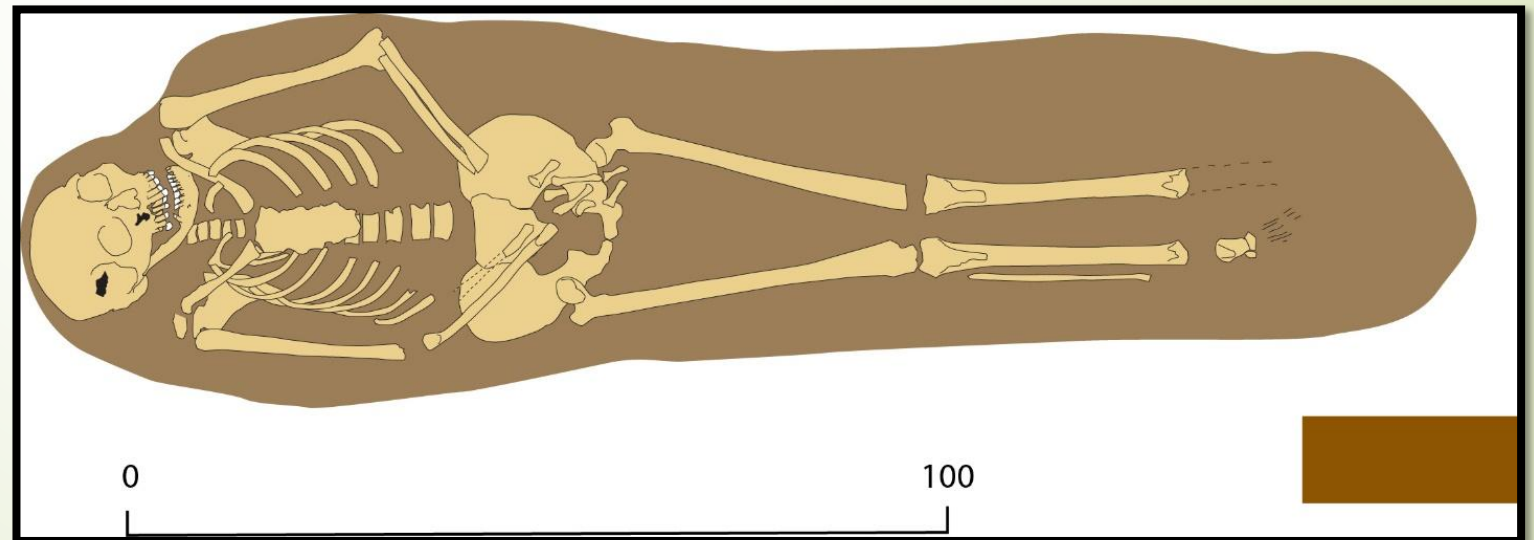
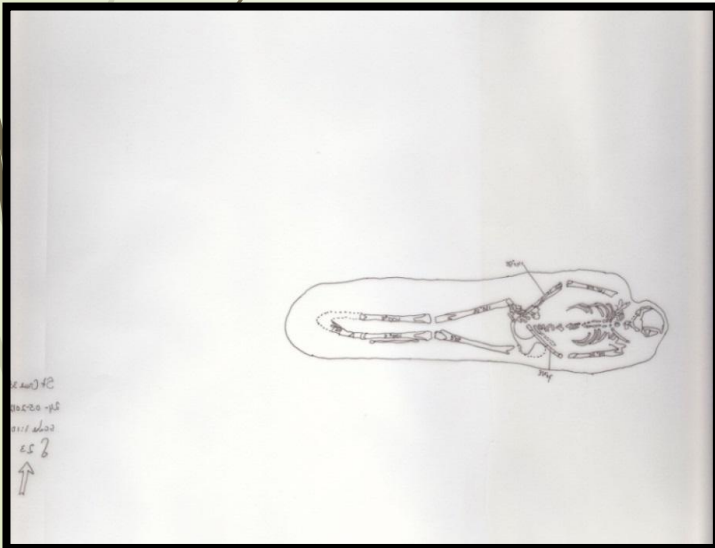




## 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery



- ☐ **A1. Primary single burial**
- ☐ **Shroud**
  - Christian burial tradition
  - Hands folded on pelvis
  - Earrings (copper and glass)





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

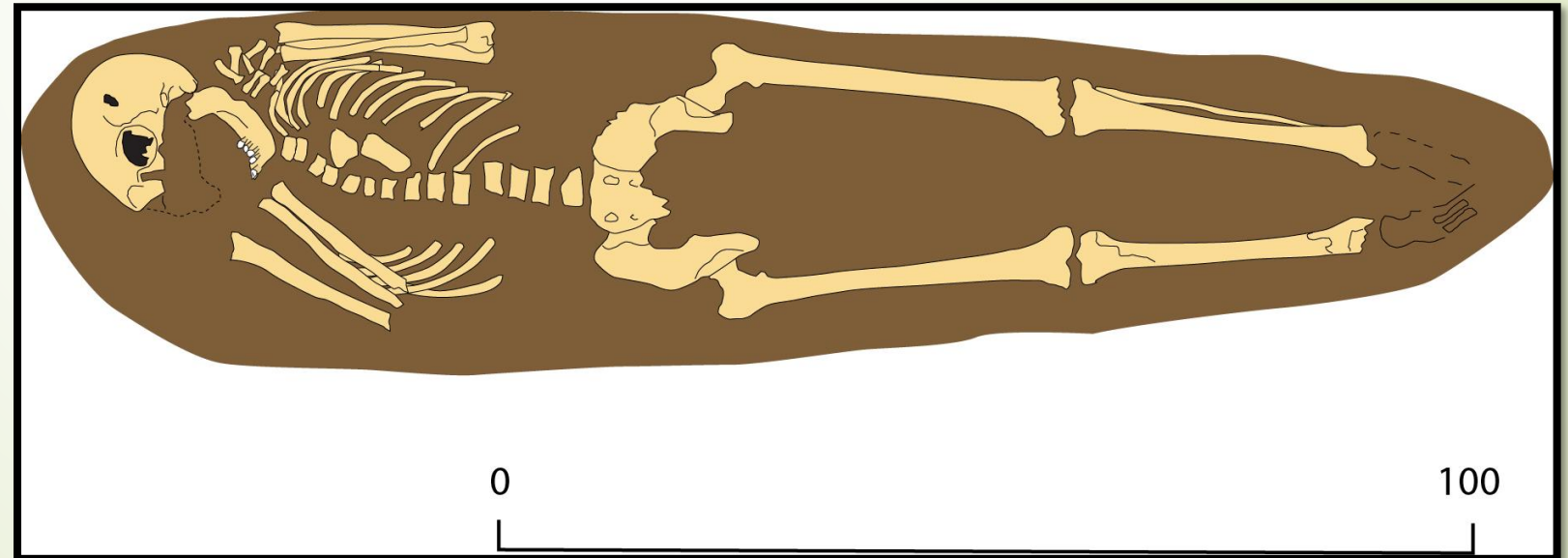
- ❑ A1. Primary single burial
- ❑ Shroud
  - Christian burial tradition
  - Hands in praying position holding a Spanish real (1700's?)
  - "Stone pillow"!





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

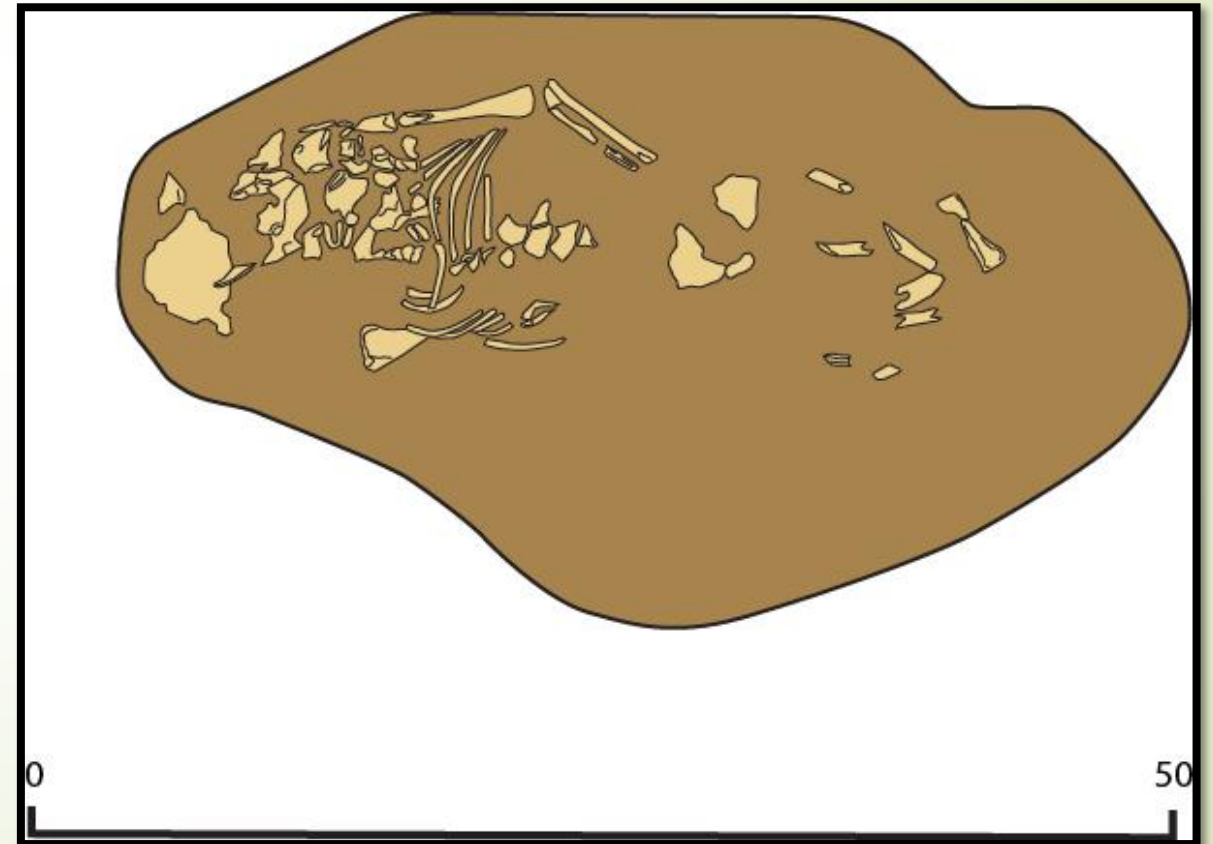
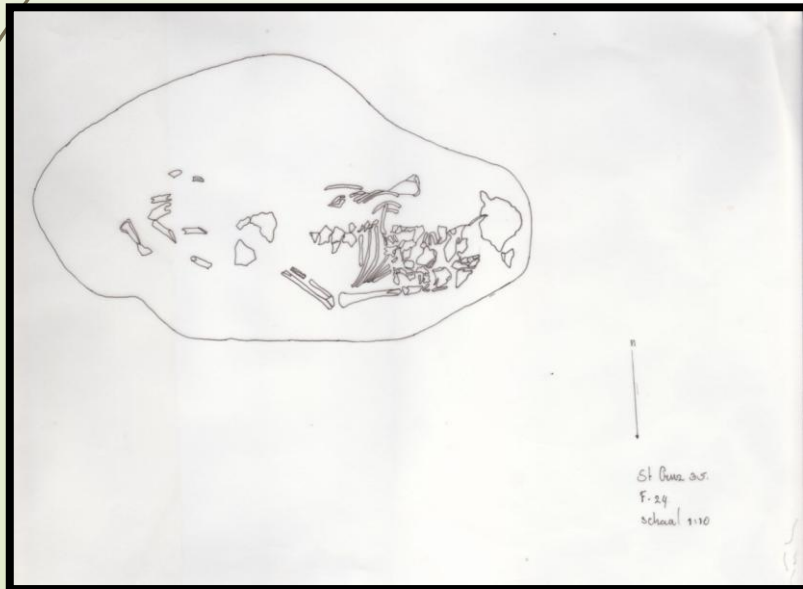
- ❑ A1. Primary single burial
- ❑ Shroud
  - Christian burial tradition
  - “Sleeping posture”: hands clasped at shoulder under the head



## 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery



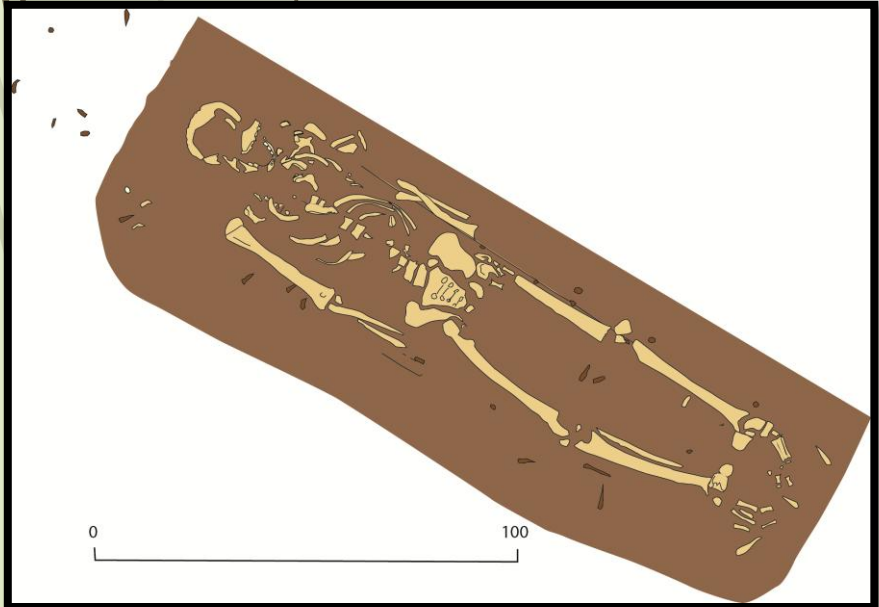
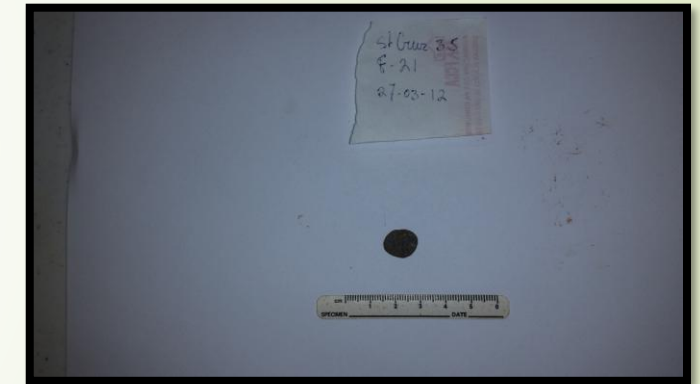
- ☐ A1. Primary single burial
- child





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- ❑ **A1. Coffin burial**
  - Christian burial tradition
  - Arms at sides
  - Real and coral
  - Crowding
  - Gnawing marks

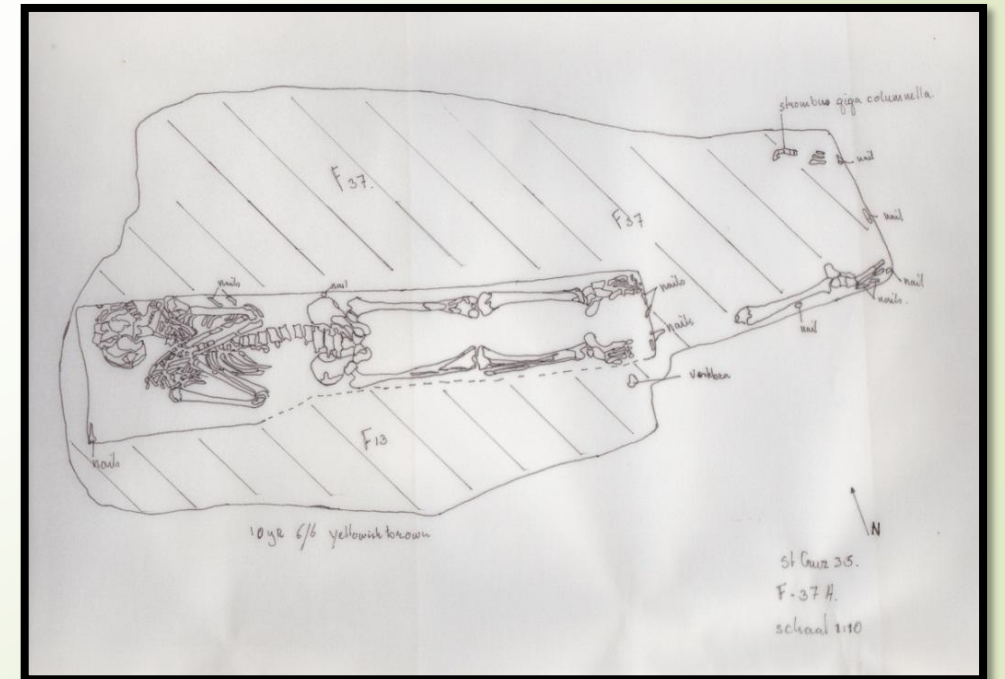
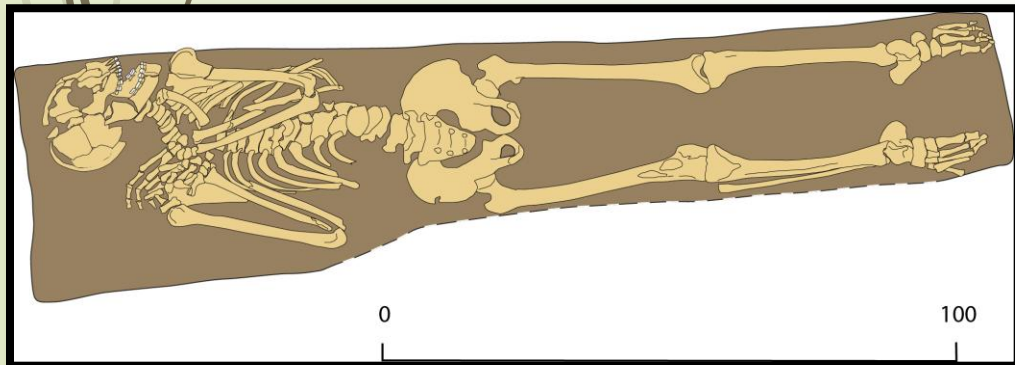




# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery



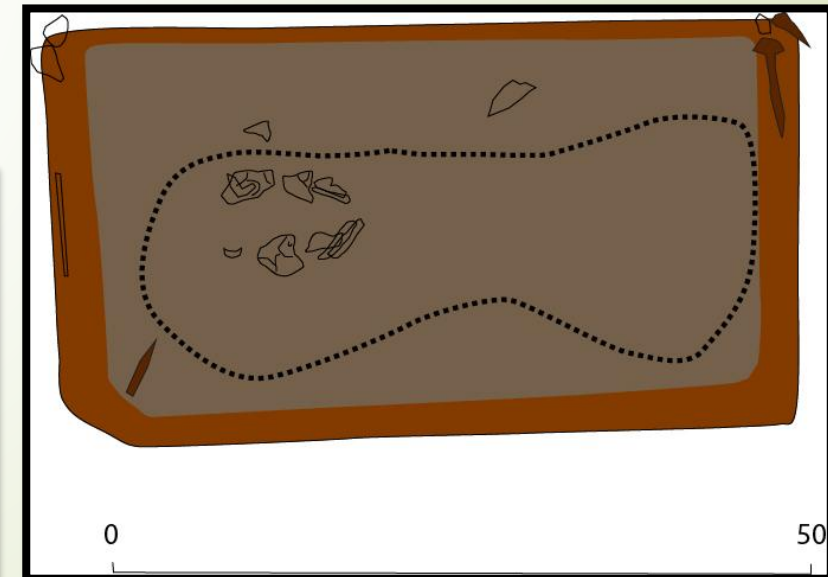
- ❑ A1. Coffin burial
- ❑ Shroud
  - Christian burial tradition
  - Arms at sides
  - “Sleeping posture”: hands clasped at shoulder under the head
  - Shell (*Cittarium pica*)





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- ❑ **A1. Coffin burial**
  - Christian burial tradition
  - Child

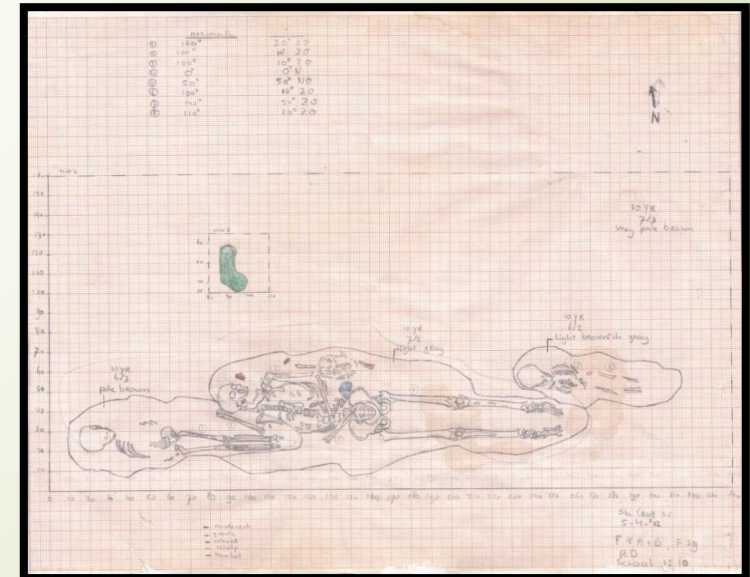
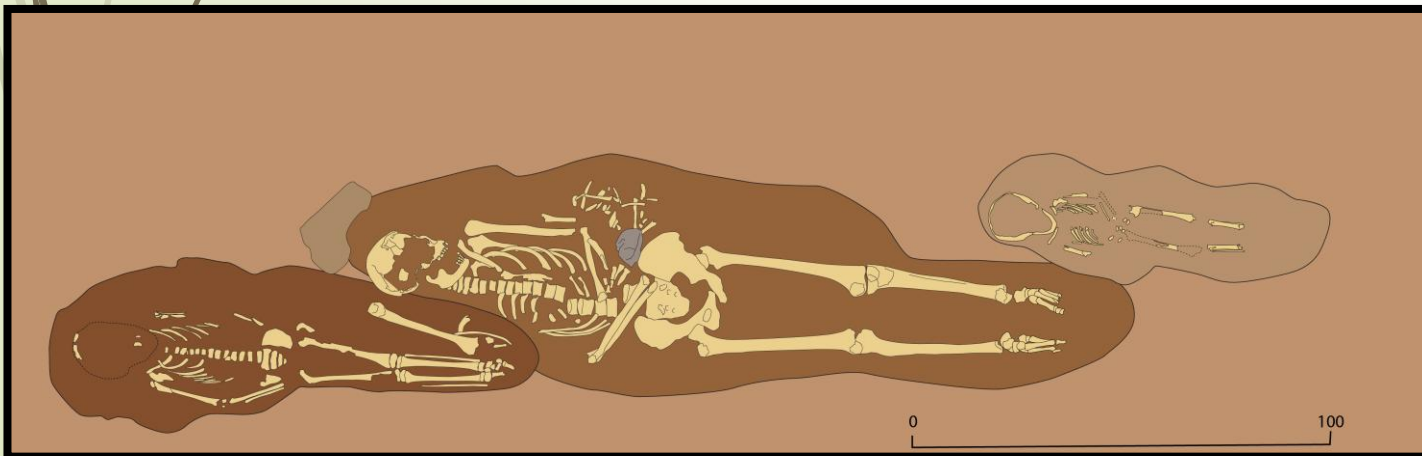




## 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery



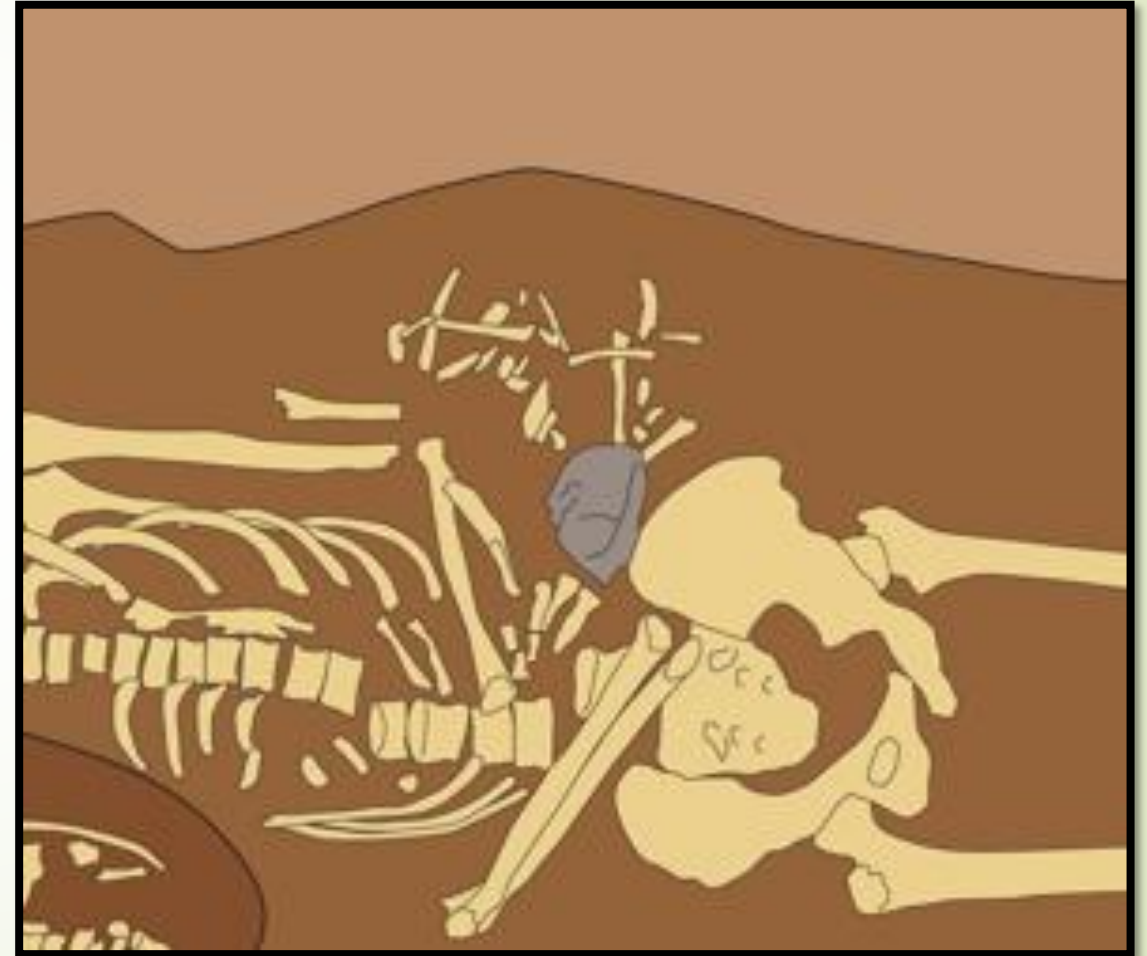
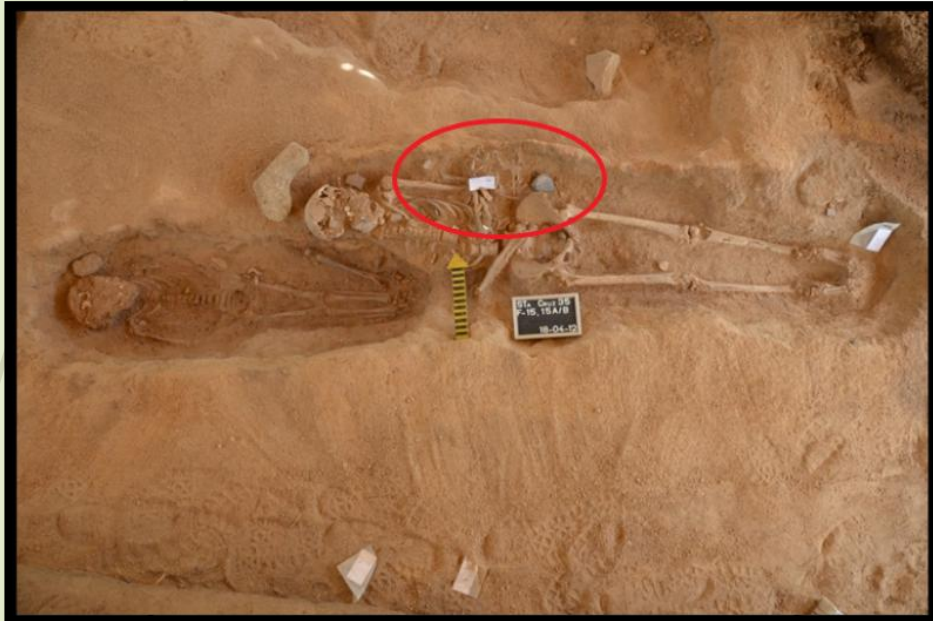
- ☐ A2. Primary burial context with multiple individuals
- ☐ Shroud
  - Christian burial tradition
  - Hands on pelvis
  - Hands on abdomen and pelvis
  - Stone and ceramics





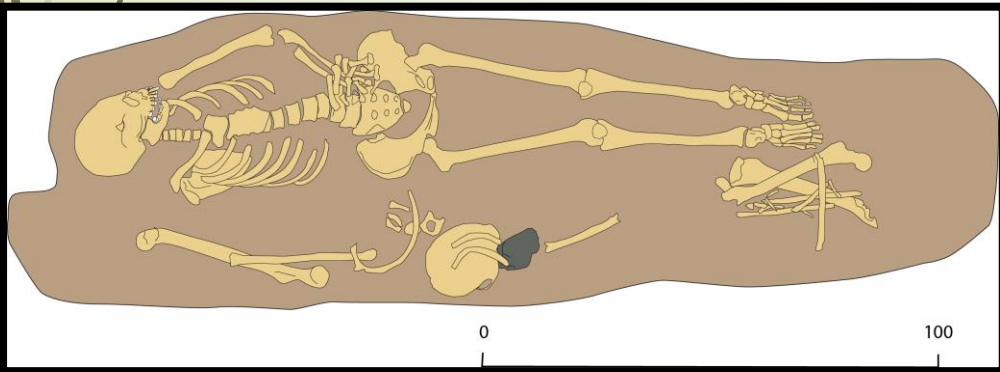
# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

- ❑ **B1. Secondary burial context one individual**
- ❑ **Shroud**
  - Christian burial tradition
  - Hands folded on pelvis



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

□ B2. Secondary burial context multiple individuals

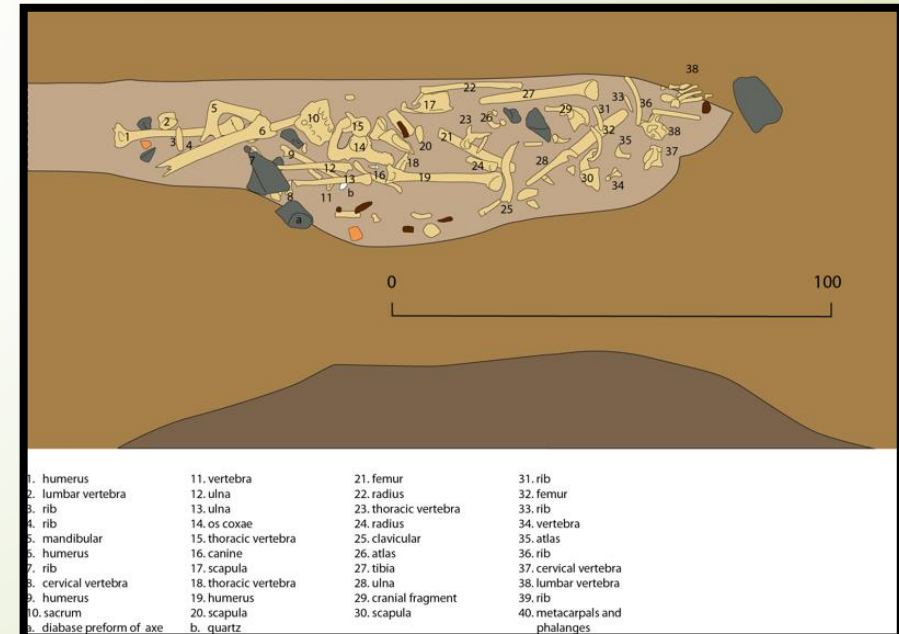




# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery



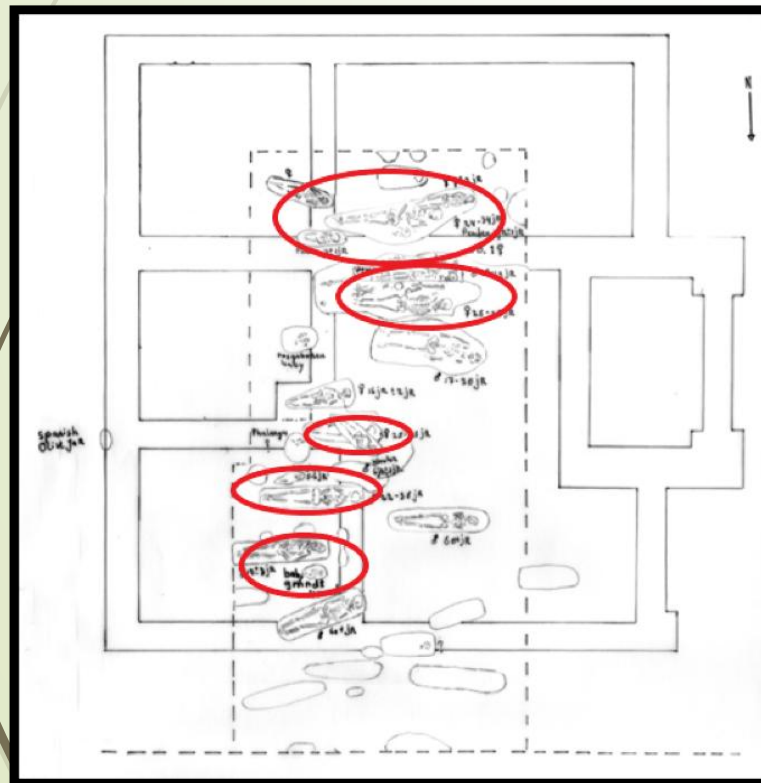
- ❑ B2. Secondary burial context multiple individuals
- Ossuary



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

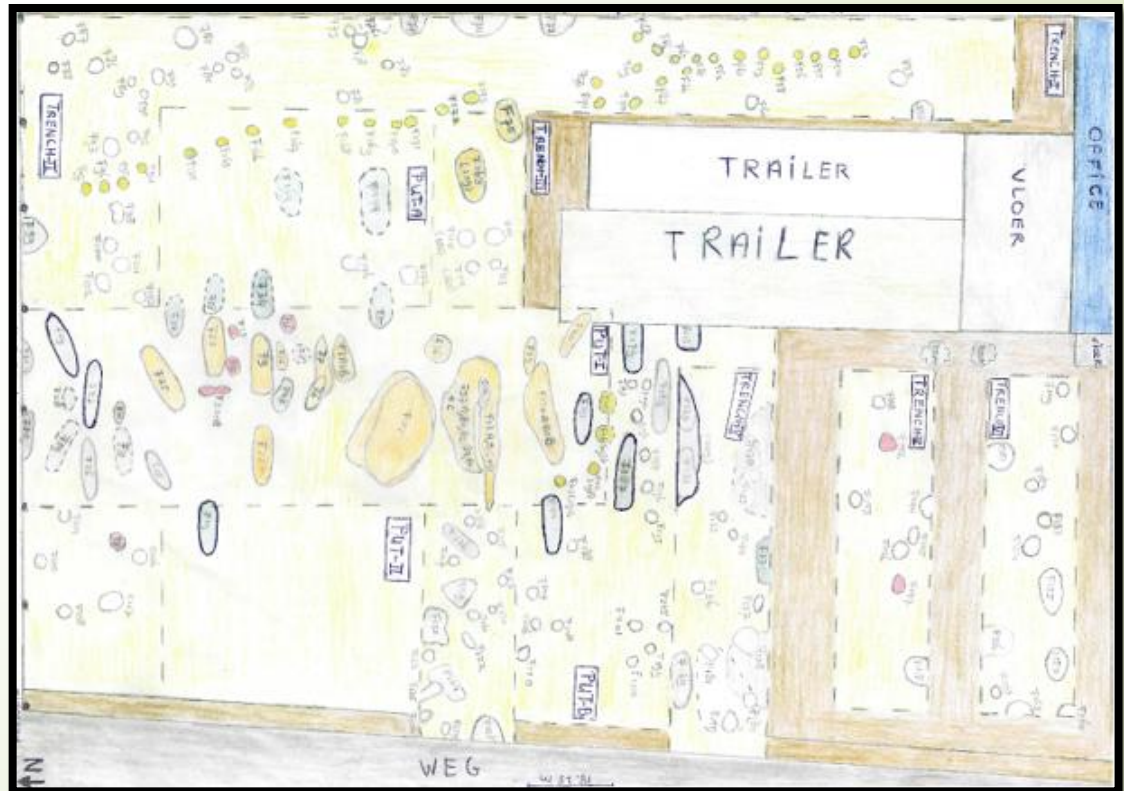
## ❖ Spatial organization and dimensions churchyard

- East-west orientation graves
- Postholes (e.g. **demarcation** in east part)
- **Dimensions** minimal ca 18,75 x 22,50 m
- **Caquetio** features (precontact or contact?)
- **No rows**
- **Family clusters?**



Legenda puttekening complete Site Santa Cruz 35 (2001, 2012 en 2016)\*

Donker bruin:	bovengrond – niet opgegraven
Geel:	loopvlak – opgegraven/geschaafd
Oranje:	opgegraven/geexhumeerde graven (excl. 75, F163/109 en F19)
Licht blauw:	achtergelaten (mogelijke) graven
Roze:	“verdwenen” graven
Donker geel:	mogelijke paalgaten
Grijs:	niet paalgat of graf (+ weg en vloeren)
Rood:	opgegraven paalgaten
Wit:	onbekend (+ trailer)
Groen:	boom (+ trailer)
Donker blauw:	kantoor
-----:	onzeker





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ❖ Conclusions Funerary Practices

- The Santa Cruz skeletal population, dated to **AD1620-1810**, were interred in a cemetery in **mainly primary burial contexts**, possibly **in association with an early church**
- **Mostly primary burials**, including **coffin burials** (minimal 4)
- There were some **secondary burials**
- **Mixture of European and Indigenous burial styles**
  - a. **European styles predominated**
  - b. **Extended supine burials** on an **east-west axis** with **various arm and hand placements** being the norm
- This is a **reflection** of the **increasing contact** occurring **between Europeans and Indigenous peoples** at the time, and European **efforts to convert** the indigenous population to **Christianity**
- The presence of a grave with the collected skeletal remains of at least four individuals (ossuary) point to **management of the cemetery by a responsible authority**
- This could have been done by **the clergy of a nearby chapel**
- Remarkably, the cemetery exhibits **no regular spatial layout** into rows of graves, as is characteristic of **contemporary European churchyards**



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

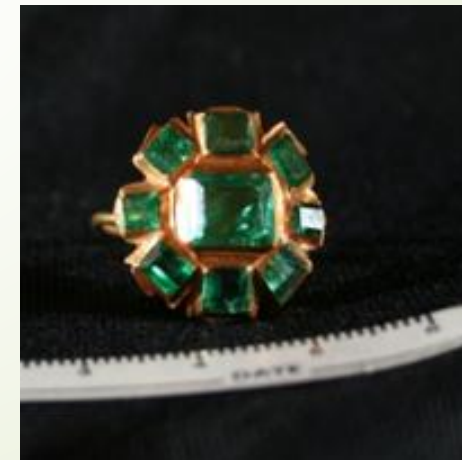
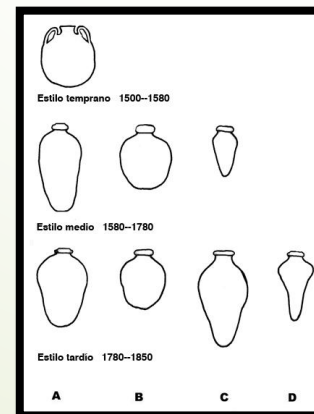
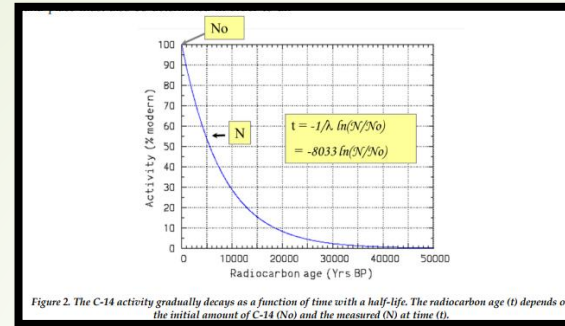
## d. Isotopic analysis

### ❖ Radiocarbon dates ( $^{14}\text{C}$ & $^{12}\text{C}$ )

- Burial F1 (Unknown) 310± 35 BP between **1620-1810**
- Burial F21 (Mestizo) 200± 30 BP between **1650-1685**  
or between **1730-1810**
- Burial F37A (Mestizo) 220 ± 30 BP between **1645-1680**  
or between **1735-1800**

➤ More are needed for the cemetery chronology

- Relative datings
- 1580-1780 (Spanish Olive Jar)
  - 1715 (golden ring with emeralds)





# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

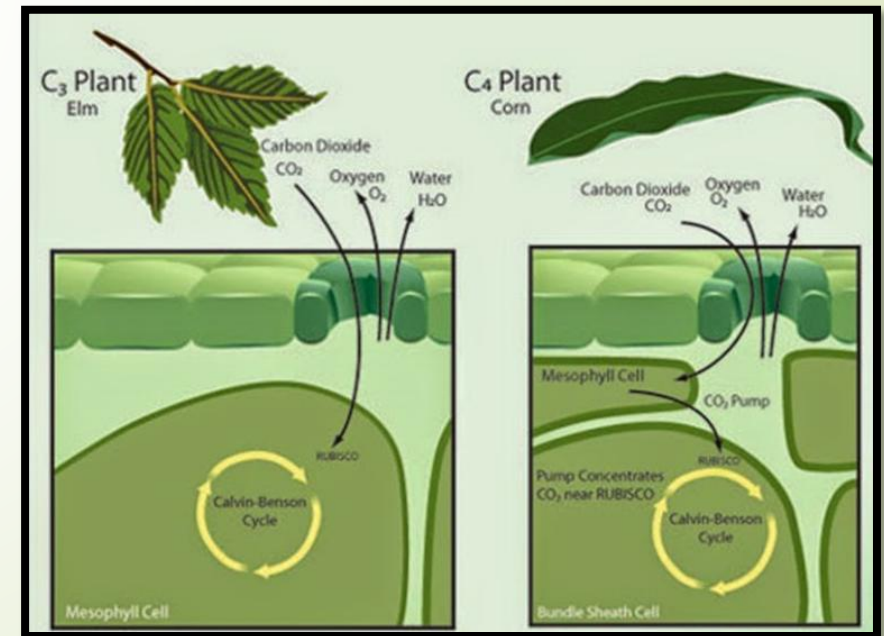
## ❖ Analysis of heavy isotopes (Sr + O of tooth enamel)

- **Six individuals** sampled: strontium isotope ratios consistent with **local origins**
- They were therefore likely **born in Aruba**
- **European, Indigenous & Mestizo** (F1, F6, F9, F15, F21)

## ❖ Analysis of light isotopes (C&N + O of bone appetite and bone collagen)

- Substantial contributions of **higher-trophic-level protein sources**, which in this ecological context likely reflect **marine foods**, but could also indicate consumption of **C<sub>4</sub> plants** such as maize or millet
- A previous study of Indigenous diets utilized **isotopic** and **dental anthropological analysis** of tooth samples from various precolonial sites in Aruba, including the Santa Cruz site (**Mickleburgh and Laffoon 2018**) concluded that both earlier (**Archaic Age**) and later (**Ceramic Age**) groups were heavily reliant on **seafood**, more so than any other insular Caribbean population studied to date
- **Laclé's** teeth morphology study (**2023**) confirms these finds

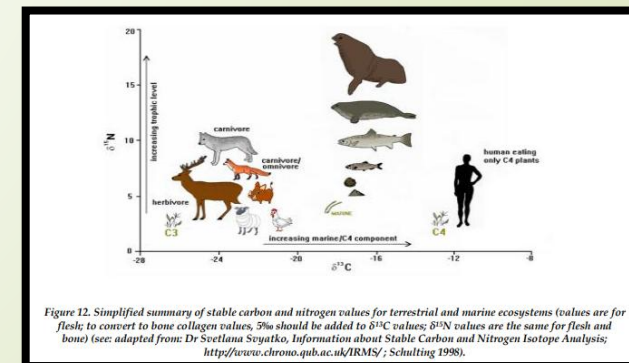
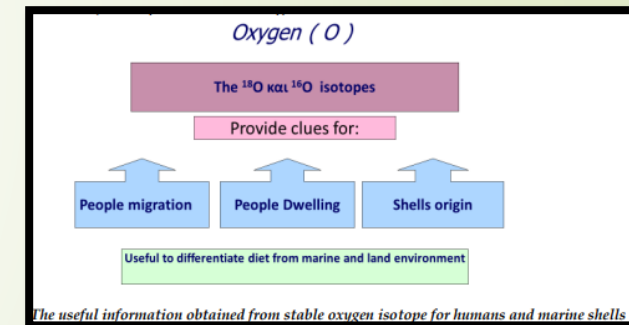
ID	elem.	<sup>87</sup> Sr/ <sup>86</sup> Sr	δ <sup>13</sup> C <sub>en</sub>	δ <sup>18</sup> O <sub>e</sub>	type	elem.	δ <sup>13</sup> C <sub>co</sub>	δ <sup>15</sup> N <sub>c</sub>	δ <sup>13</sup> C <sub>ap</sub>	δ <sup>18</sup> O <sub>a</sub>
F1	1.7	0.70808 5	-7.7	-2.9	bone	rib	—	—	-7.5	-3.9
F6	3.6	0.70819 4	-5.4	-2.0	—	—	—	—	—	—
F9	3.6	0.70829 7	-7.0	-3.2	bone	rib	—	—	-7.2	-4.7
F15	4.7	0.70848 6	-5.4	-2.8	bone	rib	—	—	-7.1	-5.7
F21	1.6	0.70841 0	-7.0	-3.9	bone	rib	-12.7	13.5	-7.1	-4.7
F37A	—	—	—	—	bone	rib	-12.2	13.1	-7.1	-6.4
F37B	—	—	—	—	bone	rib	-12.0	15.3	-5.6	-5.7
F40	—	—	—	—	bone	lbf	-10.8	14.5	-7.3	-4.6



# 6. Funerary Archaeology & Osteoarchaeology of the Santa Cruz 35 Cemetery

## ❖ Conclusions Isotopic Analyses

- *Biosocial perspectives on transformations of life- and deathways*
- The **dates** of the **Santa Cruz 35** burial site, though more recent than those from other **Caribbean islands**, encompasses a **period** of **new colonial European/Indigenous** interaction because of its **complex settlement/resettlement history**
- The Santa Cruz 35 cemetery individuals were **born in Aruba**:
  - a. Suggests **Spanish colonization in progress** and **intermixing contradicting** Aruba's history
  - b. This was **not allowed** according to **Spanish laws (forming families together)**, suggesting a **non-slave** or **free society**
  - c. Tells the **story which history has not recorded** of the **Spanish Period** (socio-cultural and political organization)
- The **stable carbon and nitrogen isotope values** from the colonial period burials at Santa Cruz 35 are some of the **highest ever recorded in the insular Caribbean**
- There are **two likely explanations** for this observed pattern:
  - a. A continued **heavy reliance on seafood** in the **colonial period** in Aruba
  - b. And/or the **incorporation of significant quantities of C<sub>4</sub> plant resources**, such as maize or sorghum, into Aruban diets
- It was also noted that there was
  - **No significant change** in stable isotope values **over time**
  - Suggests possible **long-term continuity in dietary resources**
  - Contrasts with **notable differences in dental pathology over time (Archaic-Ceramic-Historic Periods)**, probably indicating substantial changes in **food processing activities**
- Thus, two complementary lines of evidence **highlight** both **continuity** and **change** in **Indigenous foodways**
- The **interdisciplinary results** show that the Santa Cruz 35 cemetery is **quite unique**

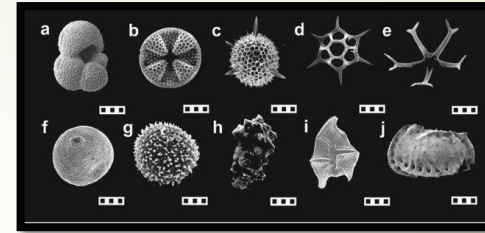




# 7. Future/Necessary Research and Analyses

## ➤ a. Planned research archaeometric techniques

- ❖ Nano sampling of grave goods
- ❖ Typological, stylistic and petrographic analyses
- ❖ Biomolecular analyses & other archaeometric techniques

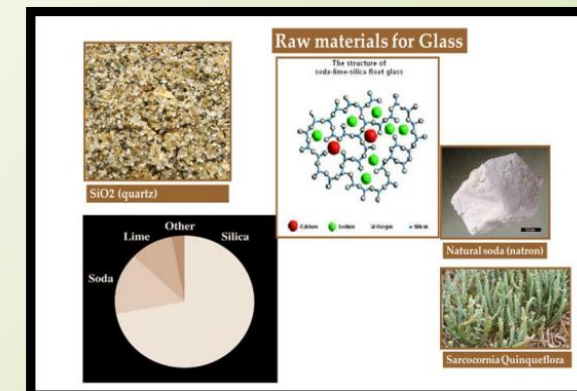
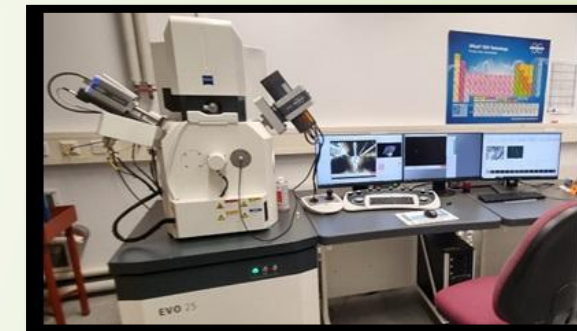


A low-tin bronze axe with a non-local lead isotope signature ...

## ➤ b. Nano sampling of grave goods

➤ Miniaturized analytical methods applied for *archaeological* or culture heritage material studies

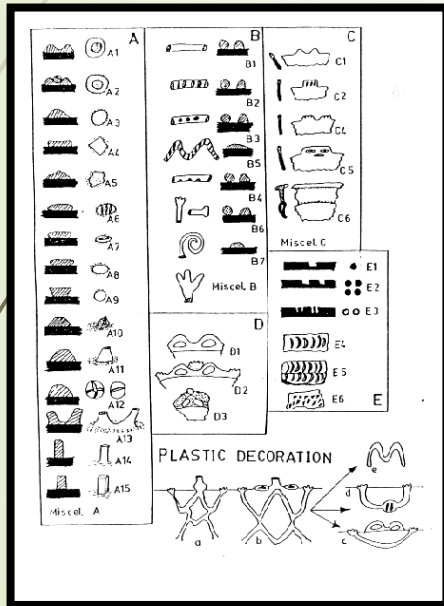
- ❖ Archaeometallurgy: the **scientific study** of **metal** and **metal artifacts** produced by **people of the past** which uses techniques from **chemistry, geology, and materials science** to understand more about the lives and culture of ancient people (technologies of mining and metal production & the trade and use of metals)
- ❖ Optical microscopy: a technique employed to **closely view** a sample through the **magnification of a lens** with visible light. This is the **traditional** form of **microscopy**, which was first invented before the 18<sup>th</sup> century
- ❖ X-ray Fluorescence (XRF): an analytical technique that uses the **interaction of X-rays** with a material to **determine** its **elemental composition**
- ❖ A scanning electron microscope (SEM): a type of **electron microscope** that produces images of a sample by scanning the surface with a focused **beam of electrons**
- ❖ Microanalysis: the **chemical identification** and **quantitative analysis** of **very small amounts** of **chemical substances** (generally less than **10 mg** or **1 ml**) or very small **surfaces of material** (generally less than **1 cm<sup>2</sup>**)



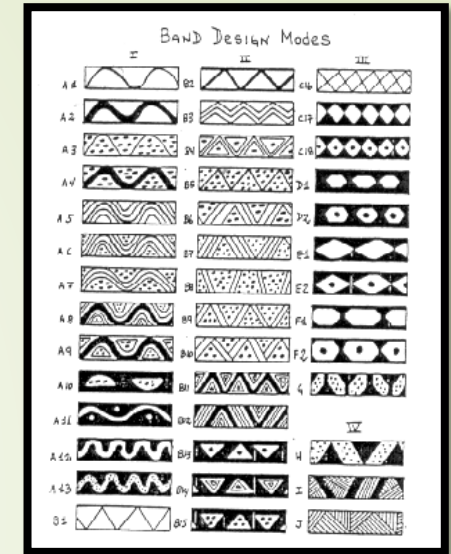
# 7. Future/Necessary Research and Analyses

## ➤ c. Typological, stylistic and petrographic analyses

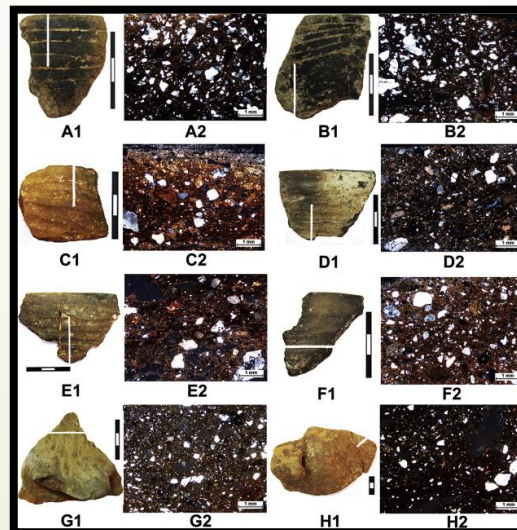
❖ **Typology:** classification of things according to their **physical characteristics**



❖ **Stylistic:** a method used to examine the **distinct characteristics** and features of artifacts and other cultural expressions in order to **identify trends, influences, and connections**



❖ **Petrographic analysis:**



the **microscopic examination** of thin-sections of **pottery sherds** (fragments) for the purpose of **identifying** their **mineral composition**. This type of analysis provides clues to **where pottery was made** and/or **where the raw materials** used in manufacture **came**



# 7. Future/Necessary Research and Analyses

## ➤ d. Biomolecular Analysis & other Archaeometric analyses

- **Biomolecular analysis of dental calculus:** disease/health
- **Biomolecular analysis of dentine:** genetic profiling

### ❑ Teeth

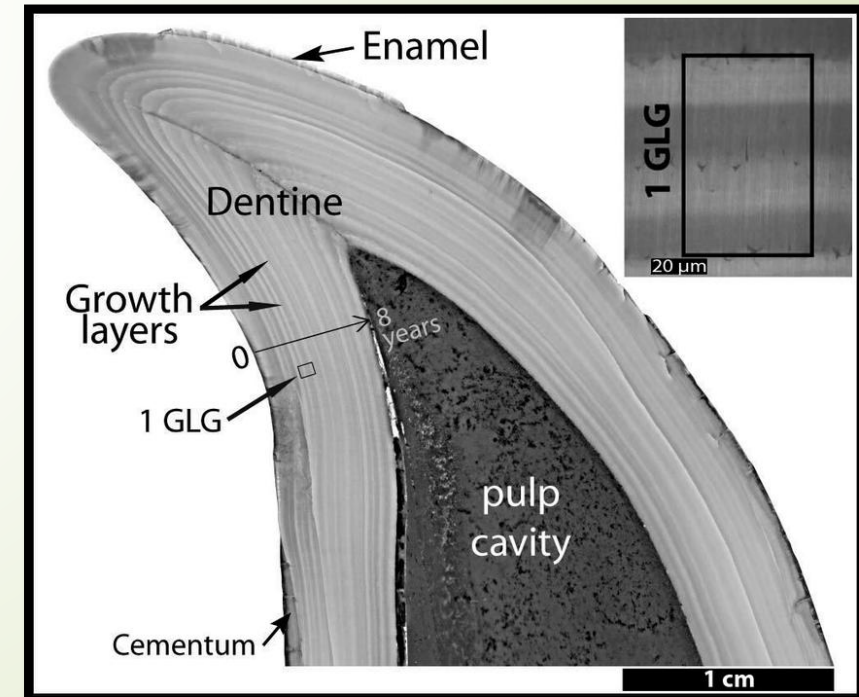
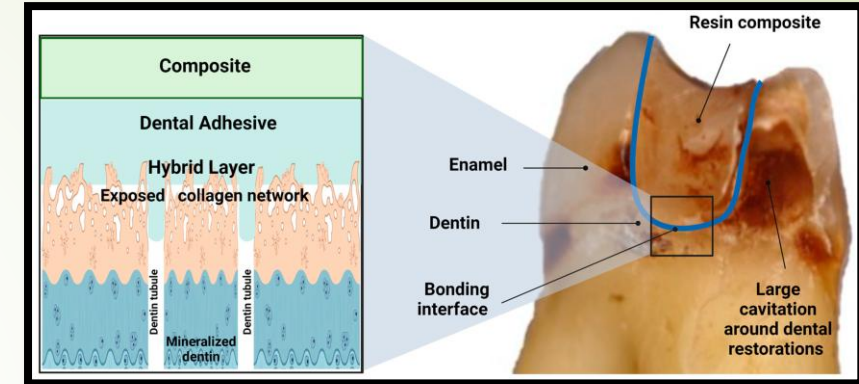
- The **hardest** and most chemically **stable tissues** in the **body**, are **well-preserved in archaeological remains** and, being resistant to decomposition in the soil, survive long after their supporting structures have deteriorated
- It has long been recognized that **visual** and **radiographic examination** of teeth can provide considerable **information relating** to the **lifestyle** of an **individual**

### ❖ Growth layers

- Can be utilized in dental analysis, such as the **frequency** with which **new layers are added**
- The length of **time** in which **this process** occurs and
- For **how long** the layers remain **unchanged** (physiological impactful events, such as parturition, menopause and diseases in cementum microstructure - these being displayed as aberrant growth lines)

### ❖ Enamel

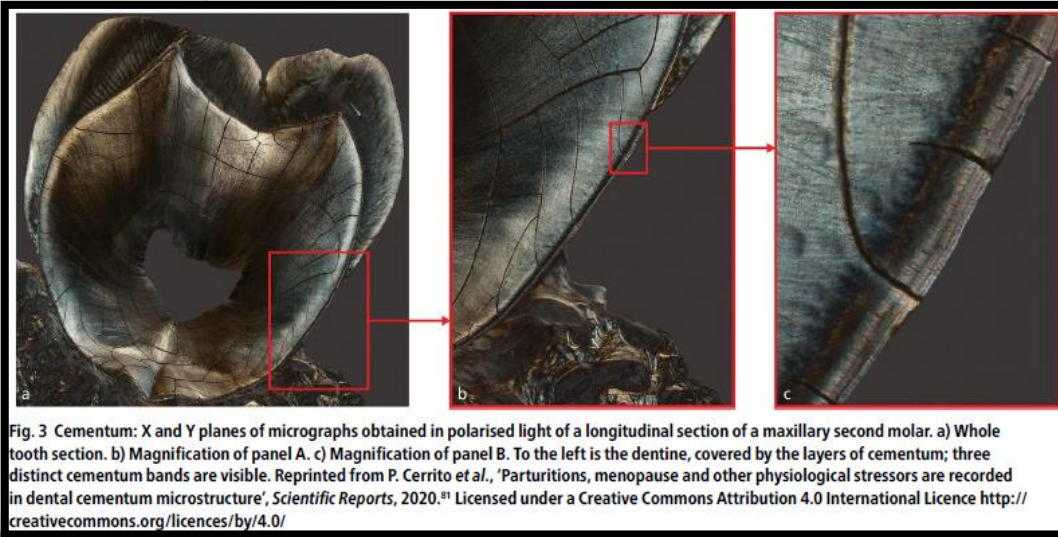
- Useful in a minimally destructive technique for **biological sex determination**



# 7. Future/Necessary Research and Analyses

## ❖ Enamel and dentine

- Useful in stable **isotope analysis** (more resistant to diagenesis than bone)
- Reconstruction of **origin, mobility** of people and animals, **health, disease** and **diet** patterns/dietary changes



## ❖ Cementum

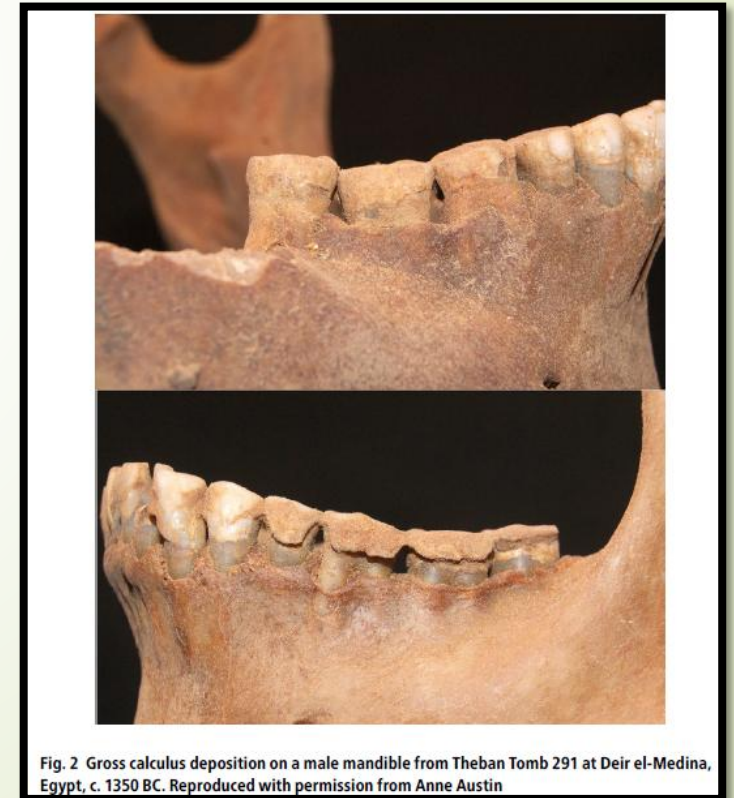
- A particular rich **source of DNA**
- **Sex determination**, indicate **familial relationships**, study **population movements**, provide phylogenetic (incl. microbiomes) information and **identify** the presence of **disease pathogens**

## ❖ Dental calculus

- Possible to analyse preserved **ancient biomolecules** and **dietary microfossils**
- Individual **culture, diet, ancestry, and health**

## ➤ Microbiome studies:

- Majority of the microbes in the human body fall into **four major phyla** such as Firmicutes, Bacteroidetes, Actinobacteria, and Proteobacteria
- The **microbiome** modulates both the **host defense responses and immunity**, thus influencing the **fate of infections** by **pathogens** (viruses, bacteria, fungi, parasites)





# 7. Future/Necessary Research and Analyses

## e. Desired researches & under analysis

- ❖ **100 glass beads** (nano-sampling X-ray Fluorescence, typological and stylistic research)
  - Where were they **made**? (Spain or the Netherlands?)



- ❖ **Coffin nails** (nano-sampling, archaeometallurgy, typological and stylistic research)
  - Are they **Spanish, Dutch** or maybe **North American**?



- ❖ Two **golden rings** (nano-sampling, archaeometallurgy, typological and stylistic research)
  - Are/is it indeed **Peruvian gold**, or not, and are the emeralds **Colombian**?

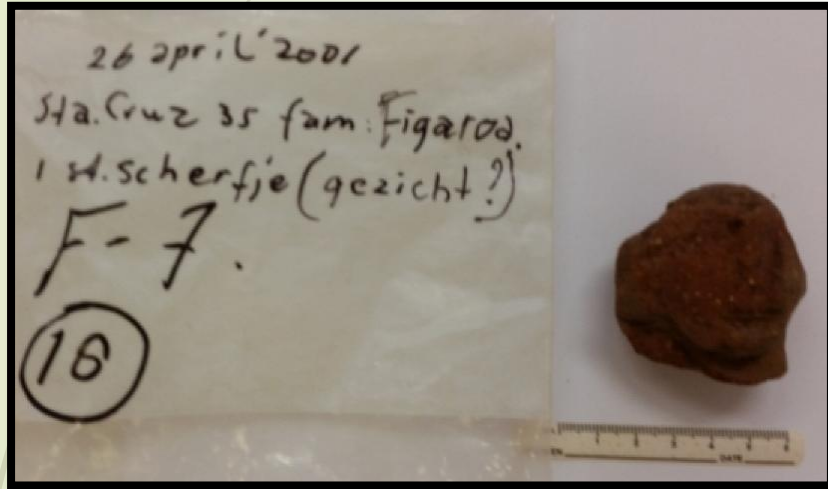


- ❖ Three **reales** (nano-sampling, archaeometallurgy, typological and stylistic research)
  - Are they **Spanish** reales?



# 7. Future/Necessary Research and Analyses

- ❖ The **anthropomorphic *adorno*** (petrographic analysis + typological and stylistic research?)
  - Is it indeed *colono ware*?



- ❖ Two **earrings** (nano-sampling, archaeometallurgy, typological and stylistic research)
  - Copper is sure, but are they made of **quartz, crystal and glass**?
  - What is their **provenance**?

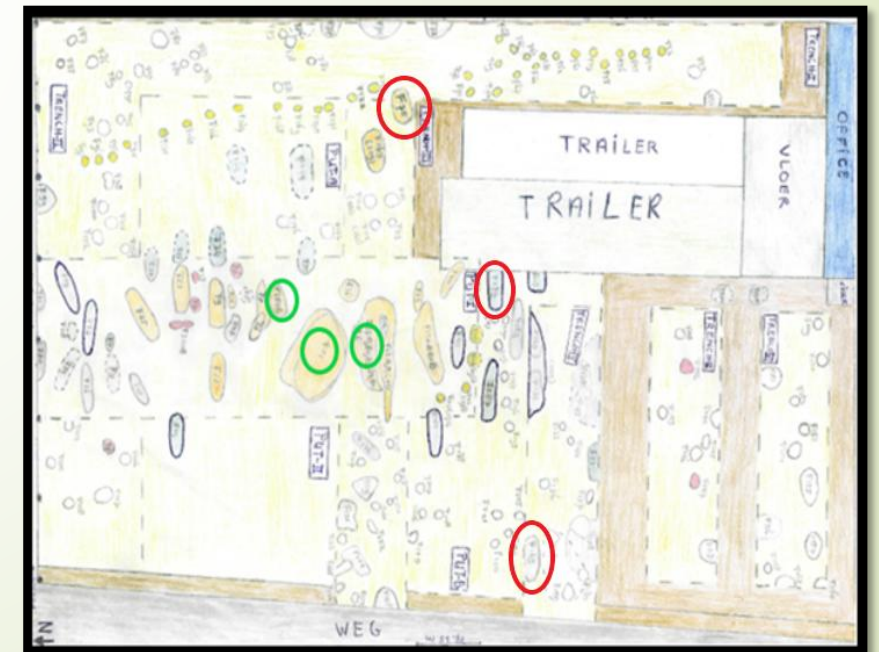
- ❖ **Concrete brick and red paint** (nano-sampling: X-ray Fluorescence)
  - Were they **made in Aruba**?
  - What are the **compositions** of the **brick** and **red paint**?





# 7. Future/Necessary Research and Analyses

- ❖ Two dog teeth and one bone fragment are at Leiden University for radio-carbon dating and isotopic analysis:
  - Site chronology
  - Provenance
  - Relation with cemetery?
- ❖ One human bone and one shell sample are presently at the Leiden University for radio-carbon dating
  - Site chronology
- ❖ Coffin wood and nails are under analysis at Leiden University
  - Radio-carbon dating
  - Identification of tree species
- ❖ One shell fragment (*Alliger gigas*), three human teeth and two bones are at Leiden University for isotopic analysis
  - Provenance
  - Nutrition
  - Paleoclimate and paleoenvironmental change
  - Seasons when were harvested (interactions humans with environment)

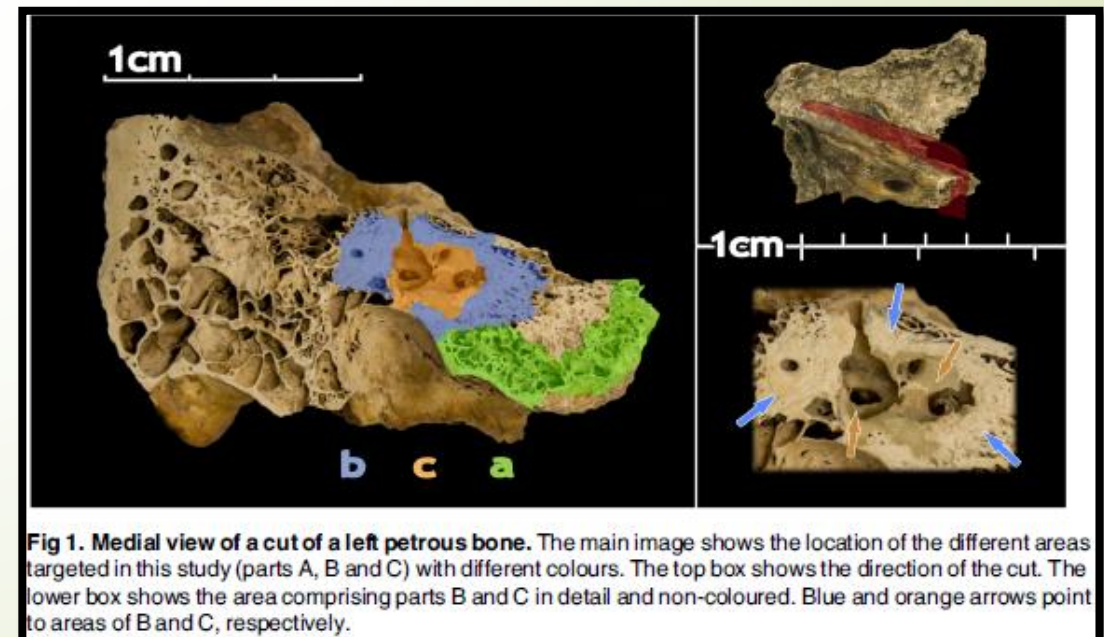


# 7. Future/Necessary Research and Analyses

- ❖ As part of a genome study of the CaribTrails project, of **two individuals aDNA extraction** (using **processus mastoideus**) was succeeded, while of **one individual aDNA** may be extracted, whereas **one still must be processed**
  - **Genetic profiling**
- ❖ Within another genome study of the Sapienza and Vienna Universities, **aDNA extraction** of **five more individuals** is being tried (using **processus mastoideus** and **phalanges**)
  - **Genetic profiling**
- **Four teeth** are currently being studied (Sapienza and Vienna Universities) for the relationship between **genetic** and **anthropological** analyses



Site (Historic)	Context	Feature	Petrous bone/teeth	Race	Sex
Santa Cruz 35	Burial	F9	2 molars	European	M
Santa Cruz 35	Burial	F13A	Petrous bone (mp r)	European	M
Santa Cruz 35	Burial	F21	Petrous bone (mp l)	Mestizo	F
Santa Cruz 35	Burial	F25	Petrous bone (mp l)	Amerindian	M
Santa Cruz 35	Burial	F37A	2 premolars	Mestizo	M
Santa Cruz 35	Burial	F37C	Petrous bone	Mestizo	F
Santa Cruz 35	Burial	F40	1 molar, 1 premolar	European	F

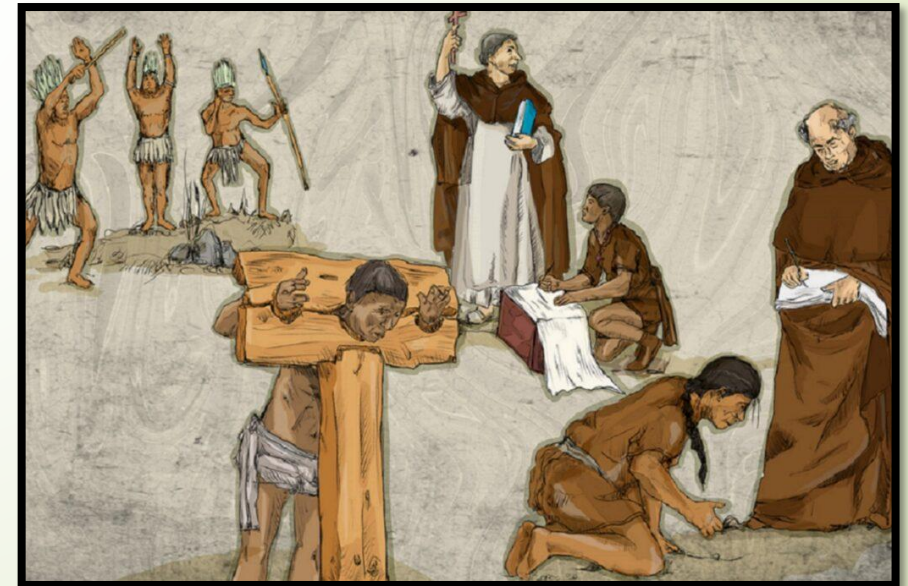
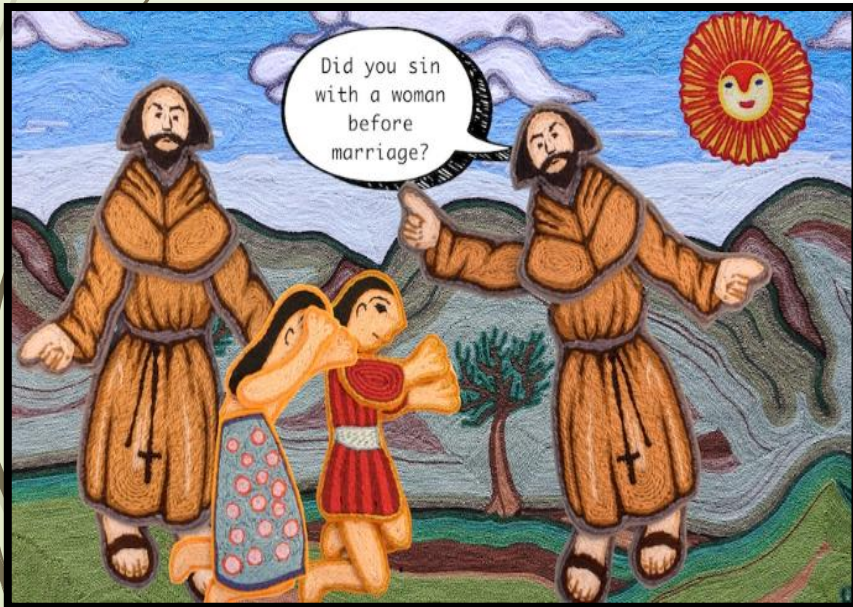


**Fig 1. Medial view of a cut of a left petrous bone.** The main image shows the location of the different areas targeted in this study (parts A, B and C) with different colours. The top box shows the direction of the cut. The lower box shows the area comprising parts B and C in detail and non-coloured. Blue and orange arrows point to areas of B and C, respectively.



# 8. Last Lecture of the Santa Cruz 35 Cemetery

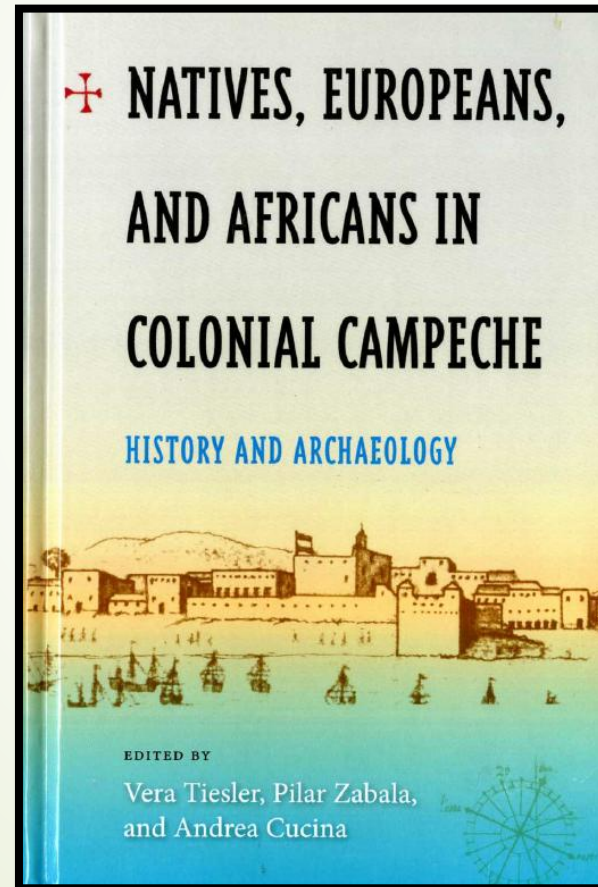
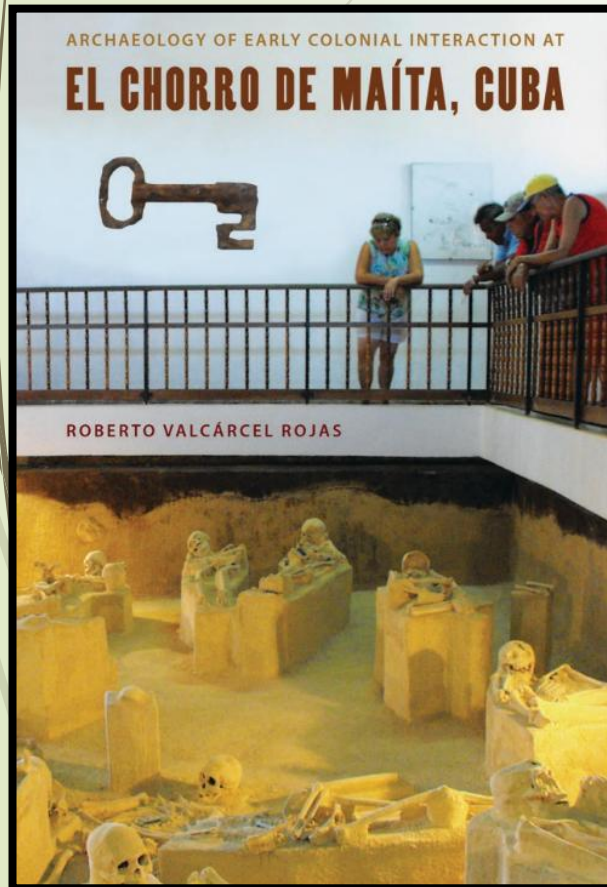
- The Santa Cruz 35 Cemetery: National and International Contexts & The Creation of a Site of Conscience
  - ❖ Confrontation of diverse worldviews
  - ❖ Late Medieval concepts of body and soul in the Old and New World
  - ❖ Late Medieval deathways in the Old and New World
  - ❖ Transformations in Deathways and Lifeways in Aruba and region



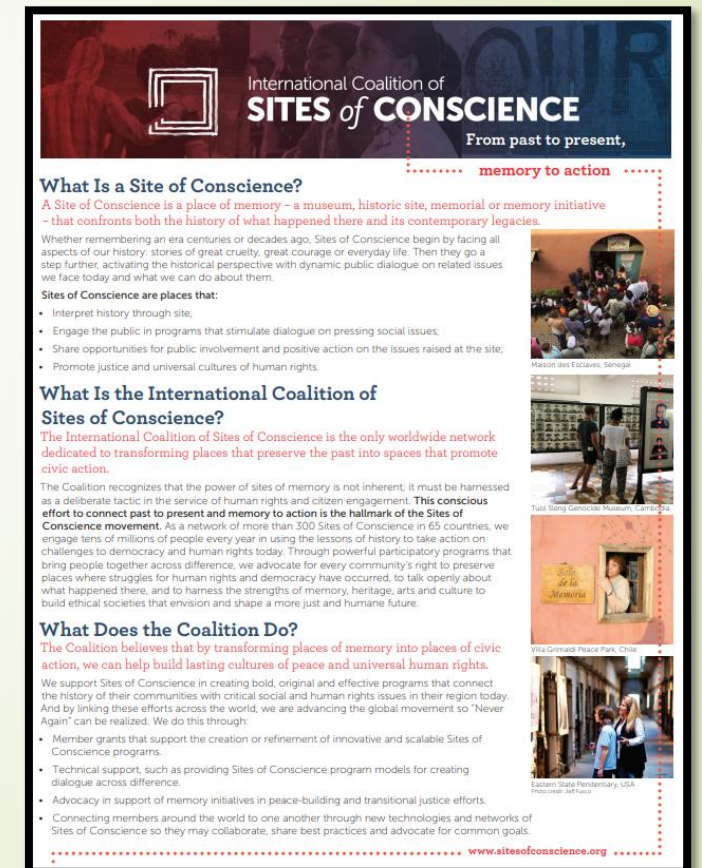


# 8. Last Lecture of the Santa Cruz 35 Cemetery

- ❖ Santa Cruz 35 in **national** and **regional** contexts



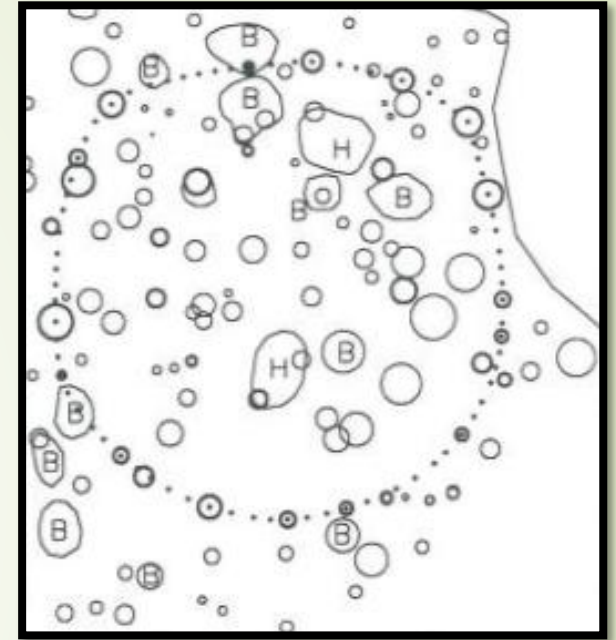
- ❖ Concept **Site of Conscience** (heritage site)
- ❖ Date of last lecture: **18 May 2025**
- ❖ **Research Questions and Relevance**





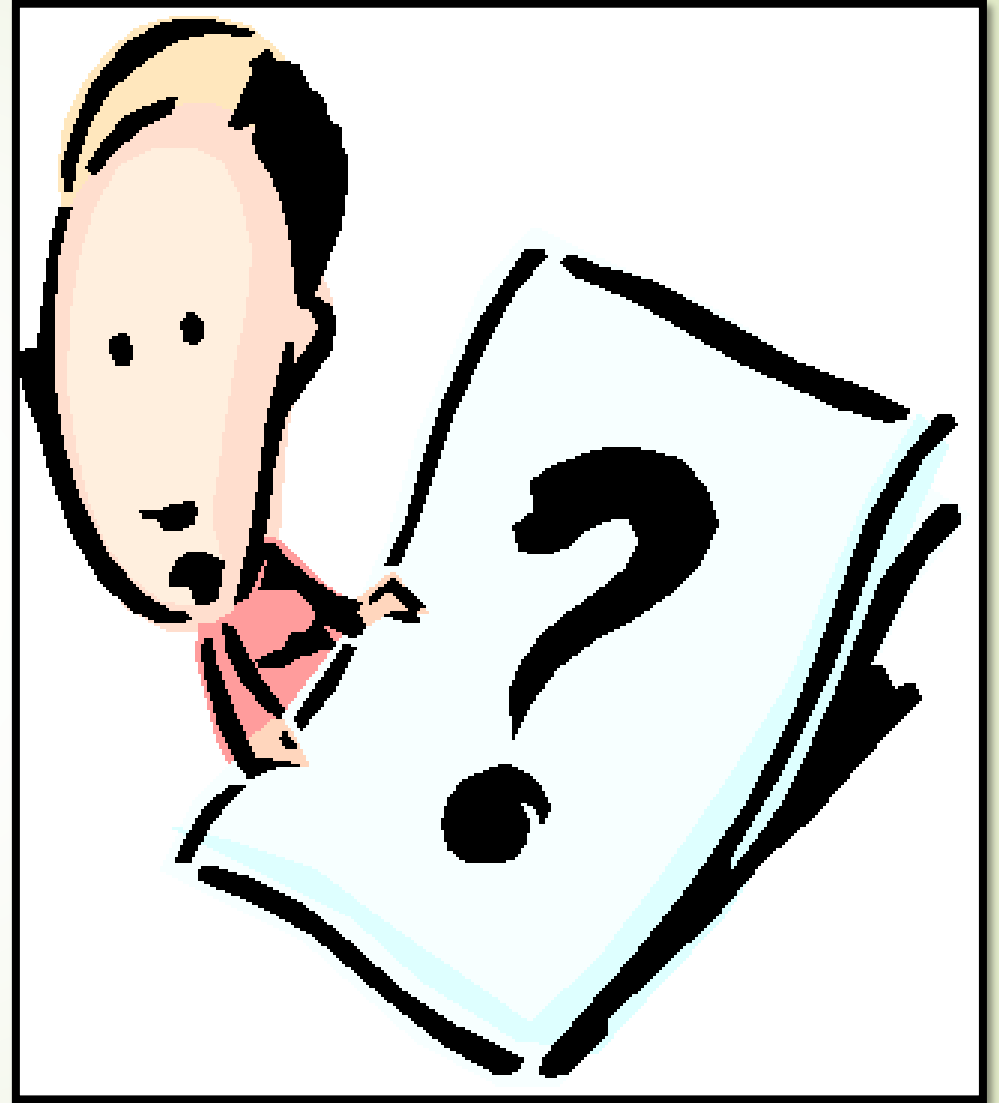
# 8. Contents Last Lecture of the Santa Cruz 35 Cemetery

- The **archaeological record** provides a perspective on **transformations in death practices** that **cannot be gleaned from historical accounts**
- The **mortuary analysis** within the **Nexus 1492 project** (2013 – 2019; including the Santa Cruz 35 Cemetery) generated important **insights** into **transformations** resulting from the **early encounters and European colonization**
- These **events impacted** the **interwovenness** of the **mortuary tradition with daily life**, which is **characteristic of precolonial populations** throughout the **Caribbean**
- In the **sociocultural and biological upheaval** associated with the **colonization**, the **integration of the landscapes of the living and the death** appears to have ceased, **just as extended mortuary ritual and engagement with the physical remains of the dead**
- The transformation toward **European mortuary traditions** resulted in a **separation of lifeways from deathways** in both **physical and sociocultural realms**



Thank you for your  
attention!

Do you have questions?





# Acknowledgements

Family Figaroa- Trimon	Family Tromp- Figaroa	Fundacion Cas pa Comunidad Arubano (FCCA)	City University New York	Universidad de la Habana
BK Consultant	Contreras Veterinary Services	Dr. Ricardo Gogorza	Department of Infrastructure and Planning (DIP)	Department of Public Works (DOW)
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Vici: Communicating Communities	Nexus 1492	Fundacion 1403	Brenchie's lab	Max Planck Institute
		La Sapienza University		

